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OFFICIAL PROCEEDINGS
OF THE
Eleventh Annual Convention
Master Boiler Makers' Association
1919

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JOHN B. TATE
President-elect

Master Boiler Makers Association

OFFICIAL PROCEEDINGS

OF THE

Eleventh Annual Convention

HELD AT

HOTEL SHERMAN
CHICAGO, ILL.

May 26th, 27th, 28th and 29th, 1919

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SUBJECTS AND COMMITTEES FOR 1920 CONVENTION

(Subject to future changes.)

1. "What is the Best Type of Washout Plug, Arch Tube or Hand Hole Plate to be Used in Order to Overcome Leaking, when Boiler is Under Pressure? Kind of Thread, Number of Threads per Inch and Taper per Foot?"—Charles P. Patrick, Chairman; John J. Orr, W. H. Laughridge.

2. "What Frebox Steel Gives the Best Results from Actual Service Test; Steel having a Tensile Strength of from 48,000 to 58,000, or 55,000 to 65,000 Pounds per Square Inch?"—William Murphy, Chairman; J. E. Fernstrum, Lewis Eberle.

3. "Is the Superheating and Reducing of Steam Pressure of Boilers Advantageous as to Stay Bolt Breakage Compared with Boilers of the Same Class not Superheated?"—T. L. Mallam, Chairman; E. J. Sweeney, F. A. Mayer.

4. "Is it Necessary to Maintain the Cinder Hopper on Bottom of Smoke Arch of all Locomotives? On What Size Locomotive Should it be Maintained? Which is the Better Design to Overcome Air Leaks?"—Frank Davison, Chairman; Thomas J. Reddy, John L. Welk.

5. "Is the Flanging of Firebox Sheets on the Flange Press Detrimental to the Material? When can Cold Flanging be Employed to the Best Advantage?—R. Gibson, Chairman; John B. Smith, J. T. Wilson.

6 and 7. "To What Extent, if any, is the Boiler Plate or Firebox Plate Injured When Welded by the Electric or Acetylene Process? Describe Preparation, Placing in Position and Welding Cracks, Patches and Sheets; also Electric Welding of Flues."—L. M. Stewart, Chairman; John Harthill, E. S. Fitzsimmons.

8. "Advantages and Disadvantages of the Madden Ash-pan."—H. J. Wandberg, Chairman; G. C. Duffy, James Walsh.

9. "Advantages and Disadvantages of the Prime Wash-Out Plug."—H. J. Wandberg, Chairman; George Austin, T. P. Madden.

10. "What is the Best Style of Grate for Bituminous Coal? Where Should the Dump Grate be Located (*a*) in Road Engines (*b*) in Switch Engines? What Should be the Percentage of Opening in Grates? What Should be the Percentage of Draft Opening in Ash Pans Compared with Area of Grates?" B. F. Whalen, Chairman; A. N. Lucas, William Strinsky.

11. To report Topics for 1921 convention.—John F. Raps, Chairman; D. G. Foley, George Austin.

12. Law.—A. R. Hodges, Chairman; J. A. Doarnberger, George W. Bennett.

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THE ASSOCIATION IN

AT HOTEL SHERMAN

In Memoriam

Charles McCandless
Died February 16, 1917

James W. Spencer
Died December 12, 1917

PAST PRESIDENTS

(*Before Consolidation*)

THOMAS C. BEST	1902–1904	Deceased
JOHN H. SMYTHE	1904–1905	
W. M. WILSON	1905–1906	
F. J. GRAVES	1902	Deceased
J. A. DOARNBERGER	1903	
W. H. LAUGHRIDGE	1904	
J. T. GOODWIN	1905	
C. L. HEMPEL	1906	

(*After Consolidation*)

GEORGE WAGSTAFF	1907–1908
P. J. CONRATH	1908–1909
A. E. BROWN	1909–1910
A. N. LUCAS	1910–1911
G. W. BENNETT	1911–1912
M. O. O'CONNOR	1912–1913
T. W. LOWE	1913–1914
J. T. JOHNSON	1914–1915
ANDREW S. GREENE	1915–1916
DANIEL A. LUCAS	1916–1919

PROCEEDINGS OF ELEVENTH ANNUAL CONVENTION

FIRST SESSION

Chicago, Monday, May 26, 1919.

The Eleventh Annual Convention of the Master Boiler Makers' Association was convened at the appointed hour in the Olympic Theatre with the President, the Hon. D. A. Lucas of Milwaukee in the chair. Members and guests registered were:

Albrecht, Frank H.
Albrecht, J. A.
Alfonte, R. B.
Anderson, Andrew
Anderson, J. A.
Ardis, L. T.
Ashback, Joseph O.
Atkinson, William B.
Austin, George
Bader, Cornelius
Badger, R. L.
Bailey, G. G.
Barnes, W. R.
Batchman, F. A.
Bauman, C. J.
Bayer, Fred.
Beck, John F.
Beland, Arthur J.
Bell, William D.
Bennett, C. R.
Bennett, G.
Bennett, G. W.
Berrey, Frank E.
Berry, John
Best, J. B.
Bleick, W.
Bliss, George
Blount, Frank C.
Boersig, H. F.
Bolman, H. E.
Borneman, L.
Bower, William G.
Brandt, John A.
Brennan, John
Bresette, R. B.
Brewer, James D.
Brooks, W. A.
Brown, A. E.
Browning, C.
Buell, C. F.
Bunting, John S.
Burdett, Thomas E.
Burno, L. J.
Burnside, C. J.
Burnside, R.
Butler, Chas. C.
Cahill, Jeremiah
Callahan, J. L.
Calmback, G. M.
Campbell, Jesse C.
Cantwell, Edward
Casey, J. J.
Chastain, J. H.
Churchill, J. W.
Clare, James E.
Clark, James C.
Clark, R. W.
Collins, James P.
Collins, Wm. J.
Conley, Albert H.

Conley, P.
Conner, F. M.
Connor, Roy
Conrath, P. J.
Conroy, L. P.
Cook, E. C.
Cooke, J. E.
Coon, Walter C.
Cooper, Alfred
Cooper, H. M.
Cooper, J. H.
Corliss, William J.
Corns, Charles C.
Cosgrove, P. E.
Courtney, M. S.
Creger, R. A.
Crimmins, R. P.
Crites, John O.
Cross, L. E.
Crowley, John
Cunningham, Alex.
Daly, James
Daly, John J.
Davey, J. J.
Davis, S. W.
Davison, Frank
Dean, C. C.
Deen, W. H.
Dertina, Emil
Dickman, H. J.
Didier, J. L.
Dittrich, A. C.
Doarnberger, J. A.
Donnelly, John
Doolin, Richard
Dougherty, T. C.
Douglass, Charles H.
Downs, James L.
Doylen, David
Duffy, C. O.
Dugan, Hugh C.
Dugan, Thomas P.
Dunford, V. H., Jr.
Dunkelberger, Daniel I.
Duntley, C. A.
Duntley, W. O.
Eberle, Lewis
Eder, Jerry
Egan, P. J.
Eisthed, Joseph
Elkins, C. E.
Evans, W. H.
Fannon, William F.
Fagan, Stewart A.
Feisner, Adolph
Feid, John B.
Fennelly, M. J.
Finucane, John T.
Fisher, George G.
Fitzsimmons, E. S.
Fogerty, Kearn E.
Foley, D. G.
Follin, E. F.
Forbell, Willard
Ford, Martin J.
Fourness, Charles E.
Fritchey, Franklin W.
Gallagher, P. F.
George, William
George, W. P.
German, John
Gorman, John T.
Gibler, Peter J.
Gibson, R. C.
Giddings, Archibald
Gilbert, T.
Gill, K. K.
Gillespie, Wm. J.
Gjertsen, Gus. H.
Glenn, William
Golden, Thomas P.
Goodrich, Jno. W.
Goodwin, James T.
Gossett, H. R.
Grace, W. R.
Graefe, Fred S.
Grant, Charles W.
Gray, Frank
Green, A. G.
Green, T. P.
Greene, Andrew S.
Griffiin, Frank A.
Griffin, M. H.
Grossart, John
Gunn, James G.
Hagan, Chas. E.

Hall, George T.
Handlan, J. M.
Handley, John A.
Hanna, Robert J.
Hardeman, L. E.
Haring, R. A.
Harper, Carl A.
Harrison, William P.
Hart, Jeremiah
Harthill, John
Hartwig, Gus. C.
Hasse, F. C.
Hayes, James C.
Healy, M. E.
Hedberg, Andrew
Heessel, J H.
Hein, Frank
Heiner C. W
Hempel, C. L.
Hickey, Frank J.
Hidde, John E.
Hiett, P. J.
Hilliger, Ernest E.
Hodges, A. R.
Hoffman, R. L.
Hogan, W A.
Hohenstein, E. H.
Holder, J. A.
Holly, C. A.
Hopp, W. H.
Houser, J. U.
Houston, E. J.
Howard, H.
Howe, Frederick J.
Hucabee, Wm.
Hughes, T.
Hunt, Edward
Hunt, E. L.
Hursh, P. S.
Hyland, Charles
Inscho, Philip
Jacob, John
Janes, R. W.
Jeffries, H. R.
Jenkins, F. J.
Johnson, Lewis S.
Johnston, Jas. T.
Jordan, Harry
Keathley, E.
Keefe, J. C.
Keidel, William F.
Kelly, J. W.
Kennedy, Hugh
Kennedy, Robert S.
Keogh, John J.
Kerr, William
Kieninger, William
Kilcoyne, Thomas F.
Kingsley, J. C.
Kinzel, G. A.
Kissinger, Frank H.
Klink, Charles M.
Knauer, F. W.
Koebernik, O. H.
Koelz, H. J.
Kovec, John
Krahenbuhl, Samuel T.
Kraus, Charles
Kremer John
Kurrasch, Charles R.
Lacey William
Ladtkow, O. F.
La Flare, M. C.
Lambert, S. P.
Larason, W. S.
Laughridge, William H.
Laysek James
Lehan, Daniel E.
Lemcke, Edward J.
Lenz, A. C.
Le Quellic, Albert C.
Lewis, Thomas
Libera, Jos. R.
Lines, Robert A.
Longacre, Charles J.
Lucas, A. N.
Lucas, D. A.
Lucas, W. H.
Lux, Peter
McAllister, W. W.
McCallister M. M.
McClintock, A. L.
McCracken, H. J.
McCune, T. E.
McDermott, John
McGarrigal, John

McHugh, L. P.
McKenna, John F.
McKeown, John
McKeown, William A.
McKerihan, T. J.
McLeod, Sam
McLoughlin, Patrick H.
McMahan, John
McManamy, Frank
McMonagle, S. A.
McNamara, J. W.
McNeil, J.
Mackey, L. B.
Madden, J. J.
Madden, T. P.
Maguire, Hugh W.
Mahar, Thos.
Mahoney, John J.
Mallam, T. L.
Mansfield, J. J.
Markey, L. W.
Marks, F.
Marshall, R. L.
Martin, Nicholas W.
Matheson, John
Mayer, F. A.
Meyer, J. L.
Miller, Charles
Miller, John
Miller, J. F.
Mims, L. H.
Minehan, James H.
Minzing, John
Mitchell, James T.
Mitchell, Lee A.
Mitchell, Thomas D.
Mohr, C. H.
Moore, Wm. N.
Morgan, A. W.
Moses, L. O.
Munn, G. R.
Murphy, Martin
Murphy, W. J.
Murray, M.
Nau, C. N.
Nau, Felix N.
Naylor, Robert H.
Neary, John T.
Nelson, H. B.
Newgirg, M. H.
Nicholas, E. S.
Nicholas, Lewis, Jr.
Nicholson, C. A.
Nicholson, E. J.
Nicol, George G.
Nimmo, J. K.
Norton, William
Novak, Albert W.
O'Brien, Thomas J.
O'Connor, Geo. A.
O'Connor, J. J.
O'Connor, M.
O'Laughlin, Thomas
Oliver, Jos.
Oliver, Thomas R.
Ollis, Luke S.
O'Malley, P. J.
Orr, John J.
Osborn, J. D.
Owen, W. L.
Patrick, Chas. P.
Peck, Laderna
Petty, Geo. M.
Petzinger, C. F.
Phares, John L.
Phelps, A.
Phillips, Edward
Pollock, William
Pool, I. J.
Pool, L. J.
Porter, E. C.
Porter, Louis R.
Powell, J. A.
Powers, John F.
Powers, John P.
Powers, Thos. F.
Praddock, Robert B.
Pratt, E. W.
Purcell, Thomas
Quick, G. H.
Rahrle, Frank J.
Ralston, J. N.
Raps, Henry J.
Raps, John F.
Reagan, Joseph L.
Reardon, Edward J.

Rearick, G. M.
Reddy, T. J.
Redmond, A. J.
Reese, J. G.
Reid, J. C.
Rice, Daniel S.
Rice, F. J.
Richards, D. J.
Riley, George N.
Ritter, Edward H.
Roan, Geo. W.
Roberts, John A.
Robertson, G. S.
Robinson, George
Robinson, G. P.
Rochess, Louis
Ruber, Leonard C.
Rushton, Horace
Russell, Robt.
Ruvane, Wm. H.
Ryan, Clement
Ryder, Corbet A.
Sadler, T. N.
Sarver, B. F.
Schmidlin, Joseph B.
Schmitt, Henry M.
Seley, C. A.
Service, H. H.
Shaffer, C. W.
Shank, W. J.
Shaule, A. E.
Shepherd, C. C.
Sherbert, Geo. M.
Shoemaker, William B.
Shumaker, L. D.
Simcox, W. E.
Simms, Edw. G.
Smallwood, Thos. G.
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Smith, D. P.
Smith, Frederick M.
Smith, H. W.
Smith, John B.
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Songer, S. T.
Sprouse, W. J.
Stallangs, W. G.
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Stewart, L. M.
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Strinsky, William
Stuebing, A. F.
Sullivan, F. J.
Sullivan, Joseph
Sweeney, E. J.
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Tate, John B.
Tate, M. K.
Thomas, Leo W.
Thompson, Peter
Tierney, J. E.
Timms, Frank D.
Todtz, Frederick
Tottenhoff, Theodore
Tracy, W. R.
Troy, John
Tucker, William
Turner, John J.
Turner, Thomas, Jr.
Umlawf, E. C.
Urban, William
Usherwood, George B.
Voss, Otto C.
Wagstaff, George
Walker, Chas. H.
Walla, Frank
Wandberg, H. J.
Warner, Victor
Washburn, Leon E.
Weis, August
Weldin, Harry F.
Welk, John L.
Wesson, Jas. A.
West, Harry V.
Whalen, Benj. F.
Whalen, Chas. P.
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Whitman, C. L.
Whitfield, William
Wigand, P. P.
Williams, J. M.
Williams, William J.

Wilson, Frank E.
Wilson, J. T.
Winnett, E. R.
Wintersteen, John
Witting, F. N.
Wolfe, Willard E.
Woolridge, E. D.
Yochem, Frank
Young, C. F.
Young, G. D.
Young, E. W.
Young, Reynold C.
Zeigenbein, Emil
Zietz, Charles
Zietz, Wm. D.
Zitterman, Paul C.
Zureick, John R.

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Anderson, J. W., Winona, Minn.
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Bell, W. C., Michigan Central R. R., Jackson, Mich.
Bentley, C. M., S. M. P., C. & N. W. R. R., Chicago, Ill.
Black, W., 7515 Blackstone Ave., Chicago, Ill.
Boltwood, Harvey, Cleveland, O.
Breed, A. C., 302 W. Armstrong St., Peoria, Ill.
Carry, C. E., I. C. R. R., Chicago, Ill.
Fegan, W. R., 49 Elmwood Ave., Toronto, Ont.
Graham, William J., T. & O. Central R. R., Bucyrus, O.
Hain, Fred B., Chief Loco. Insp., C. & W. I. Ry., 6837 S. Winchester Ave. Chicago, Ill.
Harr, John, Newton, Kans.
Hatz, G. J., 1627 Binney St., Omaha, Neb.
Hopp, Norman, 2603 N. Riverside, Sioux City, Ia.
Johnson, Rudolph, Stoney Island, N. P. Shops
Keiser, William, R. H. F., I. St. Belt Line, Franklin Park, Ill.
Kennedy, John, Pensiwind B. M., G. T., Stratford, Ont.
Kothe, C. A., Youngstown, O.
Kurrasch, F. C., G. R. H. F., N. Y. C. R. R., Kankakee, Ill.
Lacey R., 822 Maywood Ave., Hammond, Ind.
Lawhon, A. M., Knoxville, Tenn.
Longacre, Charles J., Jr., 664 Monroe Ave., Elizabeth, N. J.
Malthauer, Wm., Gen. M. M., B. & O. R. R., Cleveland, O.
Matheson, Arthur, 3707 N. Marshfield Ave., Chicago, Ill.
Matheson, Wm., 3707 Marshfield Ave., Chicago, Ill.
Moran, W. E., Power Plant Supv., B. & O. R. R., Cincinnati, O.
Murrin, J., Supt., C. & N. W. Shops, 1411 N. Harding Ave., Chicago, Ill.
McCune, W. C., Toledo, O.
McDonnell, F. V., Ft. Wayne, Ind.
Nelson, C. N., M. M., I. Harbor Belt Line, 2518 Calumet Ave., Chicago, Ill.
Pack, Alonzo G., Washington, D. C.

Powell, Raymond, 844 3rd Ave., Columbus, Ga.
Roe, A. P., G. P. A., N. Y. C. R. R.
Schycor, Charles, 340 Kennilworth Ave., Oak Park, Ill.
Smith, T. Duff, Winnipeg, Man.
Stroud, John T., Grand Hotel, Cincinnati, O.
Urban, J., 921 S. Sante Fe St., Chanute, Kans.
Vance, James R., 1118 Chemical Bldg., St. Louis, Mo.
Walker, C. N., 1111 Euclid Ave., Chicago, Ill.
Zeider, M. L., R. H. F., I. H. Belt Line, 645 Ann St., Hammond, Ind.

The President in calling the convention to order congratulated those present on the large attendance, and the divine blessing was then invoked by the Rev. Dr. R. A. White.

THE PRESIDENT: Rev. Dr. White, I want to thank you in behalf of the Master Boiler Makers for the honor you have just given us, and we would appreciate very much your spending such time with us as you see fit during our convention.

Ladies and gentlemen, very urgent business made it impossible for the Mayor to be with us. We have in his place Mr. Harry D. Miller, Prosecuting Attorney of the City of Chicago, whom I now take pleasure in introducing. (Applause):

ADDRESS OF MR. HARRY D. MILLER.

Mr. President, Ladies and Gentlemen of the Master Boiler Makers' Association:

Your President has stated that I am here in the place of his Honor, William Hale Thompson, the Mayor of the City of Chicago, to extend to you a most hearty, sincere and cordial welcome. Just why it was the Mayor asked the prosecuting attorney to come here today I do not know. I do not know whether it has significance. (Laughter). It becomes my duty to prosecute violations of the city ordinances. Perhaps the mayor thought that in the course of your enjoyment of the hospitalities of Chicago, you may violate one or more of these ordinances in the next two or three days; perhaps he thought it would be a good thing for you to know me and me to know you in case we met in the courts. (Laughter and Applause). Whether that is true or not, and I presume it is not, my friends, I want you to know that the City of Chicago does indeed extend to you the most cordial welcome that the great heart of the people of Chicago can give.

It has been my pleasure, and my privilege, in the last four years, to be the official welcomer for a great number of conventions and gatherings of all kinds. Some of these have been of men and women engaged in dealing with the luxuries of life. Others have been of men and women engaged in the business of dealing in the necessities of life. Of these two great classes, I know and you know that those conventions of men and women that have dealt in the necessities of life are by far the most important of them all. So today I feel that this convention of the Master Boiler Makers' Association is one of the most important that has ever been held in Chicago. (Applause). I want to take this opportunity of congratulating your officers and this association on the very splendid attendance here. This is the first time within my recollection that a convention had to move from the Hotel Sherman to a theatre because the hotel was not large enough. (Applause). This crowd of men today bespeaks success for this convention.

I do not know very much about your line of business. I happen to be a professional man, due, I presume, to unfortunate circumstances. I think I know a boiler when I see it, but that is about the limit of my knowledge of the business. I do not know very much about it—not much more that Pat knew about that peculiar law of nature which his doctor told him of: if the sight of one eye was gone, that of the other was a little keener; if the hearing of one ear was gone, the hearing of the other was a little bit sharper; and if one lung was gone the other had to perform the functions of both lungs, and so on. He named all the organs of the body in trying to explain this law to Pat, and finally a bright smile beamed on Pat's face and he said: "Doctor, I understand it all now. That is why it is when a man has one short leg, the other is always a little bit longer." (Laughter). That is about the limit of my knowledge if I should be asked today to sit in conference or listen to the explanations of various things of importance that you will discuss, but I know it is a very important business. I know the commercial world and business world could not think of doing business for one hour if it was not for the line of business in which you are engaged; and because of the place that you have in the commercial and business world now, the important problems you will have confronting you in this convention, the calibre of men who attend this convention, it is a great honor and a great pleasure for me, on behalf of the City of Chicago, to extend to this, one of the most important conventions ever held in this city, this cordial welcome. It becomes my privilege to hand to you the proverbial keys, if you please, of the City of Chicago. We think Chicago is a wonderful city, with the exception, of course, of all the places from which these friends come. Chicago is the greatest city of the United States. We believe that it affords to its residents and visitors opportunities for pleasure and enjoyment second to none offered by any city in the United States. We want you to participate to the fullest extent in all that we have here, to make your stay more enjoyable and your convention more successful.

Organization is a wonderful thing. Without organization very little could be accomplished. We find it in every sphere of human activity: we find organization in politics, in society, in military circles, in business, in professions; we find those men and women who are engaged in the same line of business organizing for mutual benefit and for mutual advantage, and it is the organizations that have made the business of the United States what it is today. It is organization that made it possible for the United States of America, when it was thrown into the world's greatest conflict without much notice, to bring the allies from defeat to victory. Without organization no line of business or human activity could progress with the speed that it does today; and so the larger your organization, the more powerful is your influence; the more active your organization, the more sure and effective will be your efforts in working out those things which are of mutual benefit to yourselves. We know that if this convention this time in Chicago is satisfactory to you as men engaged in this line of business, it will, of necessity, be satisfactory to all the hundreds and thousands of people who are closely allied with your business, and we want you to enjoy all of the facilities and opportunities that this city affords for your enjoyment, so that when you leave here you will take with you the most pleasant recollections of your stay. (Applause).

The President: Mr. Miller, I want to thank you, in behalf of the Master Boiler Makers and we heartily invite you to spend as much time with us as your time and convenience will permit.

Mr. Miller: Thank you.

The President: I now have the honor of introducing a man with whom you are fairly well acquainted, and who has always shown a good spirit towards the Master Boiler Makers—Mr. Frank McManamy, Assistant Director of Operation, of the United States Railroad Administration. (Applause)

ADDRESS OF MR. FRANK McMANAMY.

Mr. President and Members of the Master Boiler Makers' Association:

I did not come here today to deliver a formal address to this convention, and I have prepared none. I simply came to bring a word of encouragement to this organization from the United States Railroad Administration, and to express to you the hope that you may have a successful and pleasant meeting. I appreciate what Mr. Millar has just told you and the welcome which he has extended for Chicago to the members of this convention. To a very great extent I am responsible for this meeting, because all such matters come to me as Assistant Director of Operation of the Railroad Administration, in charge of the Mechanical Department, for approval. When this convention came to me for approval, I approved it without question because of its educational value.

I want to say to Mr. Miller that he has entirely the wrong hunch as to why his Honor, the Mayor, sent him here. It was not because we might meet him somewhere else and need his friendship—I am sure we would have it if we needed it and I am sure he would go the limit for us

—but because this is the only place in Chicago where he could get acquainted with anybody in this convention. (Applause.) If he wanted to see the Master Boiler Makers during the session of their convention, my experience with them—and it has extended over a good many years and a good many conventions—has been that he has to come right here and meet us; we will be glad to see him and be glad to take advantage of the keys of the City that he has so kindly offered us, and we will not unlock anything he wants to keep locked. (Applause.)

In approving this meeting of the Master Boiler Makers' Association, it was distinctly understood by the Railroad Administration that the purpose for which you met was in line with Article 2 of the By-Laws of the Association. May be all of you have not read that; I presume most of you are familiar with it, but I am going to read it to you:

"The object of this Association shall be the mutual improvement of its members by an exchange of ideas in meetings, the reading and discussion of papers, and a general interchange of views, so that all may profit by the experience of others more proficient in our craft."

These mechanical conventions are authorized by the Railroad Administration not for the reason, as has been stated in the applications of some of them—not this one, by the way—that it is the only vacation which the members of the association get during the year. No doubt that is true, because I know from the work that the members of this association have performed during the past two years, that this is the only vacation or the only approach to one that they have had since the declaration of war. They have been on the job 24 hours a day, seven days a week. While the organization of the army and the navy and the various other organizations of the Government all deserve their full share of credit for the work that this nation did in putting the finishing touches on the war, without the support, co-operation and work of the members of this association in building, maintaining, and repairing boilers of all kinds, good, bad and indifferent, the army and the navy would never have been able to get their supplies, their men and their guns to the seaboard—they never would have got them on the boats to go to France.

If ever there was a time in the history of the American railroads that the best efforts of the Master Boiler Makers' Association were needed, it was then when war was declared. In approving this convention it was recognized that this was not a vacation, although it is a change in work, but it was a business meeting; it was a meeting of the members of one of the most important industries in connection with the operation of the railroads, for the purpose, as stated in your Constitution, of exchanging ideas, of becoming familiar with the other fellow's methods of doing work and of telling him how to do it a little better, if you can; and if not, of learning some things from him that you could take back home and apply on your own railroad, that will make your own shop a little more efficient. That is more important today than it ever has been during the history of the railroads.

CHARLES P. PATRICK
First Vice-President

Locomotives have, as a rule, up to the last three years, stayed on their home line and been repaired in their home shops, each road following its own standard, each road making its repairs in its own way to its own locomotives. With the declaration of war, all that was changed. The congestion of traffic on the Atlantic seaboard and in the eastern sections of the country made necessary a very heavy transfer of locomotives from the lines West to the lines East; it was necessary for men on the Pennsylvania Railroad, if you please, to repair and maintain Santa Fe, Union Pacific and Duluth, Missabe & Northern and other locomotives of types and methods and construction with which they were not thoroughly familiar. It was necessary for men to operate those locomotives. While it is true they are all locomotives, yet there are certain features of each that require special attention. They have been designed somewhat differently, for two reasons, I presume; one is difference in operating, which may have some effect, and another is difference in the ideas of the designers. Whether that has any particular value or not, it is usually the controlling factor in the design of a locomotive for any particular railroad. That has been, in a measure, changed by the standardization adopted by the U. S. Railroad Administration, but it exists to a marked extent. During the period of the war we had many locomotives from roads that were in distant sections of the country to maintain and keep in service. It required all of the ingenuity and skill and effort, if you please, of the Master Boiler Makers and those working under them, to keep these locomotives in service, along with many others that were not in any too good condition. There isn't any use in my going back to that, because everybody is familiar with it; he knows what he had to contend in the last two or three years, and the Railroad Administration knows it equally well—perhaps better than the country at large. The Railroad Administration appreciates what the Master Boiler Makers' Association and various other mechanical associations have done during the past two years to get a few more turns out of a locomotive that was ready to die. These things are history, and the Railroad Administration—and by that I mean everybody connected with the operation of the railroads during the period they have been under government control—have very little to regret and much to be proud of for what they have done during the past year.

I am glad to see at this convention so many of the real Master Boiler Makers. I do not mean you fellows who are running boiler shops —you are not the bosses, although some of you may kid yourselves into believing you are. I am referring to the ladies. (Laughter). We have heard at various conventions the old story about when a couple of friends meeting and one saying to the other, "Did you bring your wife or did you come for a good time? (Laughter). The fact that so many of you brought your wives along indicates one of two things—either that that is the way you are going to have a good time—I think that is perhaps largely true—or, it indicates the fact that everybody understood fully that this was a business meeting and you were going to get the

THOMAS LEWIS
Second Vice-President

best out of it that you could; that you would bring your wife along so that she can enjoy a vacation—even if you do have to work. We appreciate the fact that so many women are here. We are glad to see them. We know we could not have a successful convention without them, or at least not as successful. I would not want to say that the men could not hold a convention, because I rather think they could, but they can hold a better one due to the fact that they have the women with them.

The convention is to be congratulated on having so many members here, after having successively skipped two conventions. While this is listed on your program as the Eleventh Annual Convention, if it had not been for the war, I think it would have been the Thirteenth; in other words, your association has skipped a couple of birthdays. You are going along and doing well, but you have not had a birthday for the last two years. The fact that we have this large and interesting attendance is an indication that the interest in your association and the value of your work has not decreased in any way. This is due to the fact that, along with other mechanical associations, you have not had time to hold your convention during the past two years.

I have gone over the papers your program makes known are to be presented, and find them very interesting. Many things can be done by this association to be helpful, not only to the railroad and the Railroad Administration, but to yourselves. In the first place, you can be helpful by selecting live subjects for discussion; subjects which are of importance and out of which you will get some real value. Your committees can do a great deal by spending considerable time and effort in preparing papers so that they will bring out the best that there is in the subject and place it before the convention. Your members can do much to help along by discussing freely the subjects that are presented. If you know a good thing, do not lock it up and take it home with you as a trade secret; give it to your neighbor; he will return the compliment because he may know something that is even better, so that in the end you may be the gainer; but above all, in your papers and discussions, do not give us any pipe dreams, do not tell us anything you think you are going to do year after next; we want the facts. We do not want what you think perhaps can be done under certain conditions, but we want everybody to have the benefit of what you are doing and what you have proven to be successful. Plenty of items of that kind can be brought up that will be of real help to every member of this association. If this association is to occupy the position which it ought to fill as the leading authority on matters in connection with railroad boiler-making, it is going to bring up only that which has been tested and tried and that you can support. In that way it will soon be recognized that when the Master Boiler Makers' Association in convention has discussed and decided on a method of work, that it has some real stability and there is something behind it. If I was to say one thing to this convention that I would like to have you remember more than all others, it is to bring out and discuss

T. P. MADDEN
Third Vice-President

the things that you know are good; not necessarily the old ideas, but the ideas that have been tested and the methods that have been proven.

Among the papers which are to be presented, in which I am interested, is one concerning the arch—the proper distance from the door sheet to the brick arch and from the crown sheet to the brick arch. Those are important factors in fire box design and maintenance. It is true that on different types of locomotives dimensions vary, but it is also true that an arch that is too close to the crown sheet will give you increased maintenance cost by heating the crown stays and by slightly overheated crown sheet, by bulged crown sheets, particularly when you get a little mud on top of it, and the distance from the door will seriously affect the steaming qualities of the locomotive. These matters have been worked out and have been pretty generally standardized, but there are many things which come up in connection with locomotive maintenance that the members of this association, through their everyday experience in maintaining arches and fire boxes, are the very best qualified men in the country to pass on; therefore, in discussing that paper, do not look at it as something that is of minor importance. It is something with which you are in contact every day, but you can save yourselves money or effort or trouble and save the Railroad Administration money while it is operating the railroads, if you will give careful consideration to those factors and have them as near right as you know how.

We have another paper on radial stays—the proper method of tapping threads in firebox sheets. There are differences of opinion as to the best method of applying radial stays, but I do not think I will find any difference of opinion in this audience on the fact that radial stays must be first properly made they must have a good, clean thread cut with a sharp tool—not one that rips off whole sections of the thread; they must be of the proper size so that they will be applied tight in the sheet; the threads must be in alignment so that they will not be stripped when they are applied, and they must be properly driven. If you do not do those things you are storing up trouble for yourselves. We may find some who advocate hurry up methods in the application of radial stays, and perhaps inferior methods. I think the application of radial stays is like the old saying about knowledge; they say there is no royal road to knowledge; there is no royal road or easy methods in the application of radial stays; you must make them right, and apply them right, and if you do not you will have a bad job.

We have another paper on Oxacetylene and Electric Welding. While that subject has been frequently discussed, it is most interesting. Without the oxyacetylene torch, which is used for cutting, and also the oxyacetylene method of welding, as well as the electric welding, our boiler shops would be about in the same position that they would be if we took the air tools away from them—they would be lost. It has been such a money and time saver, that its proper use should be encouraged in every way. If we want to discourage its proper use and kill the usefulness of the tool, there is no better way than by overdoing it, being over-enthusiastic

EDWARD W. YOUNG
Fourth Vice-President

as to what we can do with the welding torch. We can do anything in the way of cutting with the cutting torch, but the welding outfit won't build boilers; it has its limits. It can do many things better than any other tool. In many ways it can save money and time and locomotive hours, but it cannot do everything, and the one thing in connection with it is that like the radial stays, it has to be properly used by a man who knows how to do it. During the last few years almost everybody has been doing welding. It has been said many times that you can make a welder in six weeks or two months. In six weeks, or two months, you make a solderer, not a welder, and the solder is not always properly put on. It requires skill in the preparation of the parts and in the operation of the welding outfit, and a knowledge of what the work you are doing must withstand, if you are going to have a good job of welding. We have been watching the performance of electric and oxy-acetylene welds in service for several years. We have had many good results and we have had some cases where we wished we had not used it; so that, in your discussions of this subject—and I am not attempting to direct your discussions, because you know more about these things than I do—bring out the good points, what can be and has been successfully done and not the extreme or freakish performance—the unusual. It is all right to talk about it in an emergency, but when we are establishing standards or outlining methods of work for railroads or the Railroad Administration, which is now in charge, we do not want it.

The Railroad Administration wants the very best work you know how to perform. I can say that with authority because I happen to be in a position where I am trying to require that kind of work on every locomotive that is turned out of the shop. It is the cheapest in the end, and is the most satisfactory; so, in determining what you are going to do with the various tools and the various new methods, we want them used just as far as they can be properly and safely used. When you reach that limit, do not try to overdo it, because there are other methods of doing the work—ways that are reliable and that are known to be efficient. The members of this association are responsible for both quantity and quality of boilers. I do not know who it was that originally discovered the properties of steam, perhaps I have known, but if so, I have forgotten; but when he discovered the method of converting heat into work by the use of steam, he discovered something that marked an epoch in the progress of the world. I am not going to say that we cannot get along without boiler makers and without boilers and all that; everybody knows that we cannot successfully operate locomotives without good boilers and that is the important thing today.

We expect from the members of the Master Boiler Makers' Association the most hearty and sympathetic co-operation with the Railroad Administration in our efforts to properly maintain,—properly and economically maintain, if you please, and economically operate the locomotives of the country during the period the railroads are under government

FRANK GRAY
Fifth Vice-President

control. This association as well as its members have gone along and done its bit during the war; it has measured up to the requirements; you have worked overtime and all kinds of time in order to maintain locomotives and help the country in its need, but do not forget this, while the war is over, the need for good work and co-operation is not ended. There is, for this association and for the railroads and the Railroad Administration, greater opportunities, I believe, during the period of reconstruction which we are facing, than there were during the war period. This country must practically rebuild a world. Everybody that has been across or has kept closely in touch with matters on the other side realizes that during the next few years this country will be depended on to do a great deal in reconstructing the cities and countries that were destroyed during the war period. The railroad men have to do their share, and we are sure they are going to do it.

Now I know that you have a great many interesting subjects to discuss here, because I have your program. I know that while your papers are short, they direct attention to important features you all want to talk about. I know that we are going to have an interesting and busy convention. I know we are going to have some interesting discussions from the floor, and that we are all going home with new ideas and with new enthusiasm, because it will not do you any good to come to this convention and describe the very best method of doing the work, and spend four days doing that and then go home and spend the other 361 days in doing something the other way, or forgetting what you learned here. It will require real courage, perseverance and enthusiasm to go home and carry out the new ideas you learned here; but if the Administration had not felt that that was the purpose behind this convention, and felt every assurance that that would be carried out, there would not have been a convention, because we have no more authority to say that you can hold a convention for a vacation than to say it to any other class of railroad men. We are governed by the law in these matters.

I think I have said enough this morning, because I do not want to take up the time that would be better occupied by the members in discussing and telling others of the useful methods and the improved devices you are using. In fact, I am reminded of a story I have heard in respect to the Governor of Virginia who attended a convention in Richmond. It was on a subject in which he was very much interested, and he spent a great deal of time preparing a very lengthy address; it took him a long time to deliver it. He has his wife with him, because he wanted to know what she thought of the convention and of his address. Returning to the hotel he said to her: "What did you think of my address? Did you like it?" "Yes," she replied, "it was a very good talk; I think it is one of the most complete I ever heard you make, but you missed a great many things." "Missed a great many things?" he remarked. "I am surprised to hear that; what did I miss? I thought I went into that with extreme care and covered the ground very well."

"Well," she said, "you missed about twenty good stopping places." (Laughter and Applause). I do not want to miss too many good stopping places. I think here is one. I appreciate the opportunity of appearing before you and giving you a word of encouragement from the Railroad Administration. The Railroad Administration appreciates not only what you have done, but what you are going to do, because we know we are going to have the hearty co-operation and assistance of every member of this association and I think we are to get it with the knowledge that the quantity and quality of the work turned out depends on the man in charge. I thank you." (Applause).

THE PRESIDENT: I want to heartily thank you on behalf of the Master Boiler Makers for your fine address and for your friendship to the Master Boiler Makers. We are glad to have you with us.

(Vice-President Tate in the Chair.)

VICE-PRESIDENT TATE: We will now have the pleasure of listening to the address of our President, Mr. Lucas.

ADDRESS OF PRESIDENT D. A. LUCAS.

LADIES AND GENTLEMEN: It is certainly a valued privilege and a matter of keen pleasure to be permitted to welcome you to the Eleventh Annual Convention of the Master Boiler Makers' Association. Also to extend hearty congratulations you will all certainly share upon the fact that notwithstanding conditions incident to the awful foreign war deprived us for two years of the opportunity to annually renew appreciated associations and the good fellowship always afforded, our organization has remained intact and met all of its responsibilities without the slightest impairment of its usefulness. That the active interest in its welfare has been so well maintained is exemplified in an attendance today which has never been equalled upon any like occasion and in the remarkable accession to our membership the Secretary has advised we will have before the hour of adjournment arrives.

This shows, too, that not only have your officers met unusual exactions and conditions successfully, but results gained redound to the credit of the Association and command commendation for your loyalty as individual members of the organization. Without that measure of loyalty there would have been a loss of confidence, and the discouragement involved might have had a disastrous effect. As it is, determination, firmness of resolution upon the part of those in official station, and adherence to principle by the rank and file, is rewarded today by an attendance at the opening session exceeding the highest expectation and the promise of a growth in numerical strength never before known. You are to be felicitated upon this for it gives assurance for the future of the Master Boiler Makers' Association that goes beyond the brightest

HON. DANIEL A. LUCAS
Retiring President

hopes of its founders and should be an incentive to each of us to never lose faith in its progress and development.

We must not lose sight of the noble part given to our craft in railroad service and ship yards during the late conflict in foreign lands. In every heart and mind today there should be a feeling of satisfaction and happiness that it was met in the fullest degree by prompt response to every demand, a quick, cheerful and complete performance of every duty, and a spirit of co-operation that shared in the unity of intention and accomplishment which ultimately culminated in the glory of a splendid victory. There is cause for further gratulation in the consoling thought that while many answered their country's call and crossed the ocean to do their share in winning the fight for justice, liberty and democracy, righteousness and the common cause of humanity and civilization, not one of our members, so far as we now know, made the supreme sacrifice. Their lives were spared and this is indeed a great blessing to our Association.

We are mindful of the fact that from the inception of this organization boiler makers have been universally recognized as one of the biggest and most important factors in the mechanical world. This recognition has been won by fidelity to the demands of their calling and a never failing obedience to the duties imposed. While much good work has been done, their remains much more to do. Your President has no hesitancy in declaring supreme confidence in their ability, efficiency and capacity, and in their faithful performance of whatever effort may be called for, for the honor of their craft and the credit of this Association. We are banded together for mutual improvement and helpfulness and there can be no doubt of our loyal adherence to the principles and objects we strive to promote and for the maintenance of which our best efforts are pledged.

In all this work we are not forgotten by that important branch of boiler production and operation—the manufacturers and their representatives of the Supply Men's Association. We are indebted to them in many ways but in none more than that practical assistance and cooperation which is a constant source of contributive helpfulness.

It is a matter of great gratification to see so many ladies present. It is an additional pleasure to express the appreciation of myself and associates for the admirable manner in which they do their part in making our conventions a success. They are the sunshine of our existence and brighten our pathway through life. They will find themselves remembered in a pleasing way and ample provision made by the Supply Men's Association for their entertainment.

Special acknowledgment is due to those who labored so industriously to make this convention possible and conducted the arrangements for it, as well as to all officers and members who have been efficient and faithful in keeping our Association alive and sustaining the administration to which the affairs of the Association were committed at the convention of 1916. When the hour arrives for a new chief executive to be installed your President of today will retire with the feeling that as the head of this association he has had a more trying period to face than any of his predecessors and which, he hopes, none who follow him will have to endure. At the same time he has the satisfaction of realizing that in the final analysis and through the splendid manner in which all concerned did their duty the rich fruits of today's harvest were made possible, and no occasion is afforded for the expression of a single regret.

(President Lucas resumes the Chair.)

The President: Next in order is the annual report of the Secretary.

ANNUAL REPORT OF THE SECRETARY

New York, April 25, 1919.

To the Officers and Members of the Master Boiler Makers' Association.

Gentlemen: The undersigned begs leave to submit the following report of receipts remitted to the Treasurer since the convention held in Cleveland in May 1916:

1916-1917.			
From dues	$912.00		
From initiation fees	156.00		
From miscellaneous sources	45.25		
Total		$1,113.25	
1917-1918.			
From dues	$484.00		
From initiation fees	6.00		
From miscellaneous sources	2.00		
Total		492.00	
1918-1919.			
From dues	$460.00		
From initiation fees	33.00		
From miscellaneous sources	4.00		
Total		497.00	
Total remitted to the Treasurer for the three periods			$2,102.2e

HARRY D. VOUGHT
Secretary

MEMBERSHIP RECORD

It has been customary for the Secretary to give the status of the membership in each annual report. For obvious reasons this is not attempted at this time, as the membership record was so badly shot to pieces by conditions incident to the late war that it would be disappointing and unsatisfactory. It has therefore seemed best to defer it until some time before the convention adjourns, if time and circumstances will permit of its compilation, or until the Proceedings are published, when it will be more complete and reliable.

For the present it may be stated for your information that counting delinquents and those who had put themselves in good standing at the date this report was prepared we had nearly 600 names on the membership roll, 31 applications having received the endorsement of the Chairman of the Executive Board, subject to ratification by this convention.

It is most gratifying to say that following the announcement of the present convention being decided upon there was a generous response to the request for advance payment of dues, especially by those who were delinquent for several years, and in several instances the payments were for as many as 10 years. This was a good augury, as undoubtedly all will agree. It indicated that with favorable circumstances there was a lively interest in the work and purposes of the Association. It also emphasized the faith of your officers in the future of the organization, and the high opinion of its aims and objects entertained by those who had been instrumental in its foundation and progress in the past. The confidence of those who have never wavered in their judgment as to the outlook for further strength and advancement has been justified. Conditions now make it possible to resume and continue activities that heretofore were so successfully conducted for the benefit of those the Association is intended to serve. Every pleasant anticipation is in a fair way to be realized. It may be said too, that the value of membership in the Association has been magnified to a degree that should leave no question as to greater achievement and increased numerical strength in the years to come.

In closing this report the Secretary acknowledges with high appreciation the courtesy and consideration constantly received from officers and members alike since our last convention. He also takes this opportunity to express sincere gratitude for the solicitude and many messages of kindly concern with fraternal greetings and best wishes received during two periods when he was fighting for his life and restoration to health. May good fortune, prosperity and success attend you all.

Respectfully submitted,

Harry D. Vought

Secretary.

Secretary Vought: I assume that at least all the old members of the association have the report, as it was mailed to them in printed form and there is a sufficient number of copies to supply new members who are at all interested in knowing something about the membership record and the finances of the organization. I suggest, Mr. President, that without being read, it be referred to the Auditing Committee.

On motion of Mr. Murphy the Secretary's suggestion was accepted.

The President: Next is the annual report of the report of the Treasurer.

TREASURER'S ANNUAL REPORT.

May 15th, 1919.

To the Officers and Members of the Master Boiler Makers' Association:

Gentlemen: Herewith is submitted a report of the receipts and expenditures of the Association from March 31st, 1916, to April 15th, 1919:

Receipts.

Balance on hand March 31st, 1916	$ 533.88
Received cash from Secretary Vought	2,113.25
Received interest	6.00
Total Receipts	$2,673.13

Disbursements.

To H. D. Vought, Secretary, percentage on dues collected (including 1916)	$ 756.87
To H. D. Vought, Secretary, expenses attending Cleveland convention	101.67
To H. D. Vought, Secretary, miscellaneous office expense, postage, etc.	40.59
To General Drafting Co., redrawing plates and retouching	67.95
To Edwin C. Bruen, printing, postage, stationery, etc.	429.86
To Union Card & Paper Co., 1000 envelopes 7x10, made to order	13.57
To Andrew S. Greene, expenses as President	30.00
To W. H. Laughridge, flowers sent to John Harthill	3.00
To C. N. Nau, expense incident to chairman executive board	7.50
To New York Commercial, postage and binding report of Cleveland convention	370.75
To C. P. Ruce, one past President's jewel	16.00
To Addressograph, mailing plates	5.11
To G. K. Anderson, reporting Cleveland convention	100.00
To John Trosello, refund of application fee	5.00
To Fidelity & Deposit Co., premium on Secretary and Treasurer's bonds	35.00

To To T. F. Powers, stenographer's hire and telegrams	21.65
To L. M. Stewart, photos and slides for convention proceedings	11.25
To Library Bureau, one filing case	38.92
To Arson Smith, 50 Red Cross buttons	50.00
To W. N. Campbell, refund of application fee	5.00
To New York Railroad Club, two years' service of addressograph machine	50.00
Total expenditures	$2,159.69
Balance on hand	513.44
Grand total	$2,673.13

Respectfully submitted,

F. Gray,
Treasurer

On motion of Mr. Laughridge, the Treasurer's report was received and referred to the Auditing Committee.

The President: Next is miscellaneous business.

The Secretary: One of the most gratifying statements, probably, the Secretary can make at this time is that before the convention was called to order, 143 applications for membership had been received. With the number since filed and referred to the Executive Board, and others it is believed are in sight, we will enroll a total of at least 200—an unprecedented record. (Applause). The Secretary has a large amount of correspondence and various business matters accumulating since the 1916 convention. Some of this it has been possible to dispose of through the Executive Board. Other matters are still on hand for your consideration and disposition. (Reads letter signed by J. C. Teron, of the International Brotherhood of Boilermakers and Shipbuilders of America.)

A Member: I move that the report be received and placed on file (referring to the letter) and not allowed in the Official Proceedings of the convention. Carried.

The Secretary: The recently organized American Welding Society invites you to unite with them. The headquarters, temporarily, are at 33 W. 39th Street, New York City. It has a large number of signatures of different concerns interested in the work of welding.

The President: I will refer that to the Executive Board.

The Secretary: The Engineering Council—its meetings have been held here and in Washington—extends a like invitation.

W. H. LAUGHRIDGE
Treasurer

A MEMBER: I move its reference to the Railway Age Committee appointed a year and a half or two years ago to take care of consolidation with other organizations. Carried.

THE SECRETARY: The Chief of Mechanical Engineers of the Queensland Railways, Australia, in acknowledging a letter from the Secretary, says that "membership in the Master Boiler Makers' Association means much for every one identified with the craft," and he expresses his interest in the association.

Mr. William C. Crum, of Eagle Grove, Iowa, asks to be placed on the list of honorary members because, on account of ill health, he has been pensioned by the road with which he was formerly connected.

MR. POWERS: I know Mr. Crum personally. Owing to ill health he is no longer in the service but is pensioned by the railroad, and on that account I move that he be made an honorary member. Carried.

THE SECRETARY: Reference has been made to a committee which was spoken of as the Railway Age Committee. I think the members of that committee are Mr. Powers, Mr. Laughbridge and Mr. Sarver. The Secretary received resignations from Robert E. Thayer, George B. Herr, E. A. Averill, Alfred Goodfellow, W. S. Thomas and Carlton Riddle.

MR. PATRICK: I move that those resignations be referred to the Eecutive Board. Carried.

THE PRESIDENT: Next in order is unfinished business. Has any member of the association anything to offer. If not we will take up new business.

MR. WINTERSTEEN: We have a gentleman with us today who has attended our conventions for seven or eight years, who has helped very much to push things along and in his official capacity is associated almost daily with every member of this association. The Executive Committee recommends and I move that Mr. A. G. Pack, Chief Inspector of Locomotives of the Interstate Commerce Commission, be elected an honorary member of this association.

The motion was seconded by Mr. A. N. Lucas and carried.

MR. PACK: This is an unexpected pleasure, an honor conferred upon me which I had not anticipated, and I assure you it is very much of a surprise. I believe, some of my friends have put one over on me. I want to thank this convention for the honor they have bestowed upon me and assure you that it is sincerely appreciated. I hope to be able to show my appreciation of being made an honorary member of this body in every way possible, both personally and by reason of my position. I again thank you. (Applause).

THE PRESIDENT: Is there anything further under the head of new business?

MR. MADDEN: Permit me to tell you what the Missouri Pacific has done to increase the circulation in the locomotive boiler. One of the most important of late improvements in boiler design to secure greater economy in operation and maintenance, is a horizontal baffle plate installed in the barrel of boiler. Tests indicate results fully up to expectations.

Sluggish circulation in the barrel of boiler retards evaporation of water. The steam film forming on the hot sheet and tubes if not carried away acts as an insulator. With rapid circulation in the boiler it is quickly replaced by the water which absorbs the heat units and promotes better evaporation.

Increased circulation is created by the application of a diaphram sheet extending across the boiler and riveted to the sides, within 4 inches of back flue sheets and 30 inches of front flue sheet. Pipe vents are provided to take care of any steam pockets that might form under the baffle sheet.

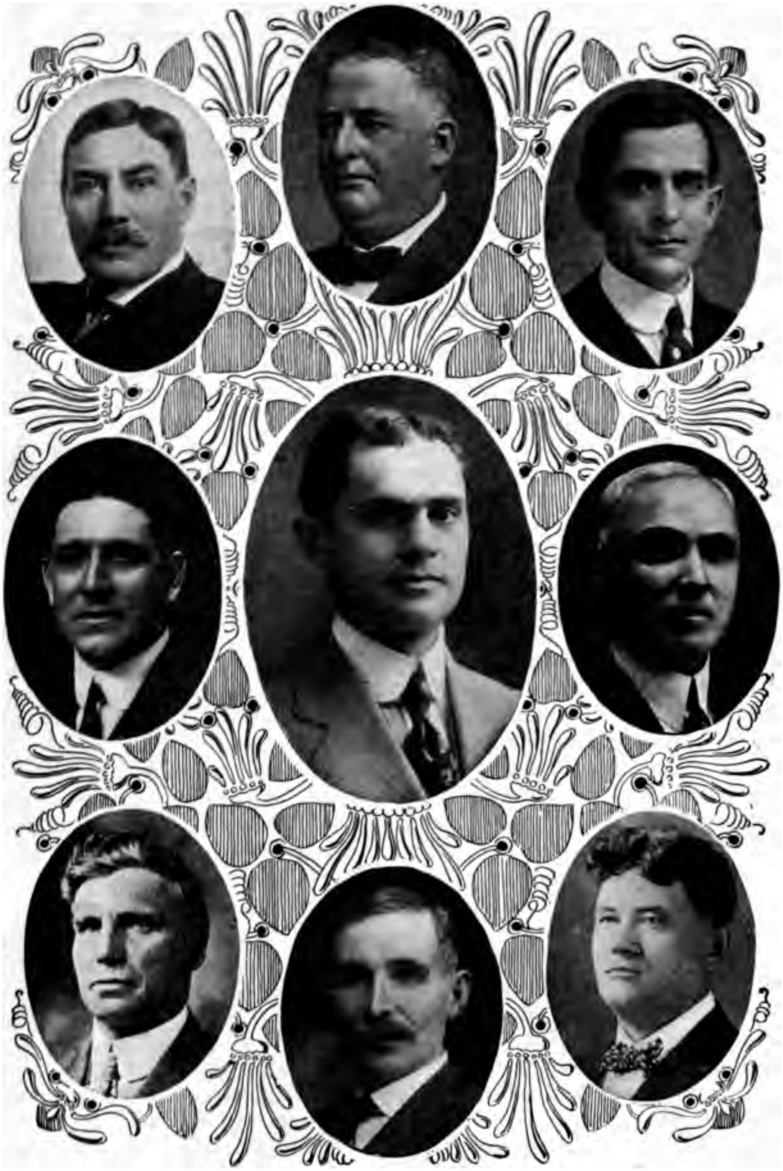
An application for test purposes was made on a 100-ton engine of the Consolidation type and used in heavy freight service. Improvement in steaming quality was noted at once. After ten months of service steaming tests were made with the following results: Time required to raise water from 212 degrees F. to 75 pounds pressure was shown to average 30 per cent. less than on locomotives without the device. The saving in fuel in road service was about 10 per cent.

The circulating device appears to materially aid locomotives in carrying water. Used in a district where 472 miles was the average between washouts, this engine made 1,180 miles with no trouble, although there was accumulation of mud in the mud ring which could have been considerably reduced by frequent short blow-offs on the road.

It may also be of interest to know that exhaust nozzle of this engine was increased from standard 5¾ inches to 6¼ inches.

Inspection of the interior of the boiler after 10 months' service showed that increased circulation had done much in keeping it free from scale and mud deposits. The copper ferrules at the flue sheet were clean as well as the threads on the radial stay bolts. The appearance of the interior of the boiler resembled a white-wash coating.

Arrangements are being made to install the device on Mikado and Pacific type engines and it is expected that tests will warrant the device being made a standard installation. Poor circulation is causing the destruction of steel boilers with heavy steel plate. Railroads are compelled to spend thousands and thousands of dollars yearly for renewing the bottom in boiler shells scarcely eight years old. Railroads are compelled to scrap thousands of dollars' worth of flues not two years old. After watching the performance of the engine mentioned for the 11 months, I am convinced that corrosion and pitting will be eliminated to a great extent.



EXECUTIVE BOARD

Left to right: A. N. LUCAS. B. F. SARVER. T. F. POWERS.
Center: HARRY F. WELDIN. JOHN F. RAPS, Chairman. E. J. REARDON, Secretary.
Bottom: JOHN HARTHILL. HENRY F. WANDBERG. L. M. STEWART.

The next in order is the appointment of Special Committees.

The Secretary announced the following appointments by the President:

Audit—George W. Bennett, Chairman; T. F. Powers, Frank A. Griffin.

Resolutions—W. H. Laughridge, Chairman; Charles P. Patrick, M. O'Connor.

President's Address—B. F. Sarver, Chairman; Andrew S. Greene, George Wagstaff.

Memorials—J. A. Doarnberger, Chairman; P. J. Conrath, J. B. Tate.

THE SECRETARY: No further business on the Secretary's desk.

MR. E. W. YOUNG: One company of the 13th Railway Engineers organized to reconstruct the railroads in France, was made up of employees of the Chicago, Milwaukee & St. Paul, and commanded by our old friend and fellow-worker, Alexander Young. While in Chicago I went down to the Municipal Pier to pay my respects to Captain Young, and others in the company whom I might know. I found them drilling and during the hour I watched them, failed to see a boiler maker I knew. After the drill, I had my visit with Capt. Young and during our conversation asked how many boiler makers were in the company? He replied, "I am allowed six, but I haven't any; they are all turned down. They can't hear." I said, "Do you expect to get boiler makers that can hear?" He replied, "It don't look like it, and if I do, they won't be worth a damn.". (Laughter.) Later they had all the boiler makers they wanted. Numbers of them were willing to go if only given a chance. We have heard much about patriotism and "do it for humanity's sake;" that is something the boiler maker did long before the late war or any other—he gave up his sense of hearing for humanity's sake. He is the battle-scarred veteran of this industrial conflict, the martyr of his trade in doing his bit to keep the industrial beehive busy. He "got it in the ear" and for the sacrifice that he made, he ought to be respected and given due credit. Does he get it? I think not, but I hope the day is near when he will. (Applause.)

On motion the convention adjourned until May 27th, 9:00 A. M.

SECOND DAY

The convention reconvened at 9 A. M.

THE PRESIDENT: The convention will be in order. We will now be honored with an address by Mr. A. G. Pack of Washington, Chief Inspector of Locomotives of the Interstate Commission.

ADDRESS OF MR. A. G. PACK.

Mr. President, and gentlemen of the Master Boiler Makers' Association:

It affords me very considerable pleasure to be with you, and enjoy, and I know profit, by this, the eleventh annual convention of the Master Boiler Makers' Association. I sincerely hope it will be one of the most pleasant and successful of the many conventions you have already enjoyed.

The work of the craft, of which your organization is representative, is most essential to the successful operation of the steam operated railroads.

I believe great good is accomplished by such gatherings, as this when the free exchange of experiences and methods of performing your duties are had. This exchange of ideas becomes valuable to your co-workers and also to your employers, when discussions, of the results obtained by the various methods of performing your work are sincere. It has, however, been my experience in the past, that many people discuss methods and practices from an egotistical standpoint, rather than from a viewpoint of the results actually obtained, and, when so discussed, the knowledge which should be gained is lost.

The railroads of every civilized country, and especially so of this vast country of ours, where distances are great, are as essential to the life of the nation and its many industrial enterprises as is the blood that trickles through one's veins, to life. When you have weakened the railroads, you have weakened, if not destroyed, the life of the nation and crippled its industries.

This was well illustrated during the winter of 1917-1918, when the demand for war supplies and materials was so great that it became necessary for this great Government of ours to step in, in self defense, and take over and operate the railroads; otherwise the results of the Great War, which was then being waged against autocracy, and for democracy, might have been differently written.

Under our present methods of operation, the locomotive is one of the most essential, if not the most essential part of our present system of railroad transportation, is the heart of the railroads, for, without this machine, there can be no train movement. When the locomotive is properly maintained, it is capable of performing great good; when neglected, it is turned into an engine of great destruction, both to human life and to property. In order to effectually utilize this indispensable machine, it must be properly designed and consructed, inspected, repaired and operated.

The foundation of the locomotive, the boiler, with which you gentlemen are so vitally interested, and fill so important a place, may be likened to the foundation of a magnificent structure. Without the foundation, there can be no useful building; without a properly designed, constructed and maintained building, the foundation is of no value. Therefore, each intricate part of this valuable piece of mechanism must be properly maintained, in order to effect safe, efficient and profitable service.

The craft, which you represent, occupies an important place in the construction and maintenance of this magnificent and useful machine, but it should be borne in mind that each of the other crafts, connected with its construction, maintenance and operation, is equally essential to its successful performance. To properly construct, maintain and operate the railroads, which constitute the great thoroughfares of industry, proper financing, constructing and operating are required. The whole can be likened to a splendid automatic machine. Let one of its many intricate parts become unjointed, and the entire fabric is crippled and its usefulness greatly impaired if not lost. Therefore, each individual craft and each invidual employee, engaged upon and in connection with these great arteries of transportation, is equally essential; and they are, to a greater or less degree, dependent upon each other for success.

In order to obtain the safest, most satisfactory and most economical service, it becomes incumbent upon each of us to perform our duties in a way that will bring the best results, and the "greatest good to the greatest number." Above everything else, however, the uppermost thought in our minds should be that of safety—"always safety first."

You may damage the machine that hauls the great volume of traffic from place to place and from point to point, and that damage can be repaired; but when, through failure of some part or appurtenance, or the carelessness of some individual, the life of one of our fellow beings is wiped out, or they are crippled for life, this damage can not be repaired. Neither does such damage end with the person who is injured, but often works with increasing severity upon those dependent upon him for life's necessities and for his protecting care. Nor is this the only loss that is suffered when the life of one of our fellow employees is taken. The employer is frequently deprived of a most valuable employee, at a time when his services are greatly needed.

As long ago as 1838, Congress perceived that the conservation of life and limb was one of the most vital subjects in which organized society was interested, and, realizing the great danger attached to the operation of steam pressure vessels, when not properly inspected and repaired, enacted what is known as the Steam Boat Inspection Service Law, which Act is administered under the jurisdiction of the Department of Commerce, and provided, at that time, that certain safety devices, such life boats, signal lights, fire pumps, hose, etc., should be retained on every steam boat; that the boiler should be inspected every six months, and the hulls every 12 months.

This Act was amended and strengthened in 1843, 1849, 1852, 1853, 1864, 1865 and 1866, until finally, in February, 1871, Congress passed an amendment to this all-important Inspection Service Law, which substantially gives them their present authority and organization, and which has unquestionably been of great worth, in the conservation of human life.

The Government has, I believe, more than 25 different Bureaus, engaged in such service, none of which, in my opinion, is of greater value than those of the Interstate Commerce Commission, that apply to all common carriers engaged in interstate traffic by railroad. Nor is it believed that any of them have been of greater benefit to the employers and employees alike, in the saving of life, the conservation of property and the prompt movement of traffic.

I do not believe there is any other one individual in the United States who has any better general idea of the condition of locomotive power than the Chief Inspector of Locomotives. He gets it from all over the country and from all sides. He gets it from an unbiased viewpoint, and I say unhesitatingly that if the boiler had been in the same condition in 1914-15, when the great increase in business took place, that they were in 1910-11, the railroads would never have operated till 1917. (Applause.)

Appreciating the great loss of life and injury to persons and property, on the railroads, Congress, in 1893, enacted what is known as the Safety Appliance Act, which applies to all common carriers engaged in handling interstate traffic, by railroad. This Safety Appliance Law, with its subsequent amendments, requires that certain safety devices shall be applied and maintained on all cars and locomotives engaged in the movement of interstate traffic.

In 1907, recognizing that the long hours of service, which were required of train service employees, and those connected with the dispatching and movement of trains, were contributory causes for many accidents, Congress enacted what is commonly known as the Sixteen-Hour Law, or, Hours of Service Act, which provided that the hours of service of such employees should not exceed 16 hours, except under certain prescribed limitations.

In 1908, Congress passed what is known as the Ash Pan Law, which requires that all locomotives used by common carriers, engaged in the movement of interstate traffic, shall be equipped with an ash pan which can be dumped, emptied or cleaned, without the necessity of any employee going under such locomotive.

In 1910-1911, the attention of this great law-making body was directed to the large number of accidents and casualties resulting from the failure of the locomotive boiler and its appurtenances, as a result of which, the Act of February 17, 1911, commonly known as the Locomotive Boiler Inspection Act, was passed, approved by President Taft, and became effective July 1, of that year.

This law, with which I am directly concerned, as the executive head, is administered under the jurisdiction of the Interstate Commerce Commission, and provides in its most essential feature, that,

> "It shall be unlawful for any common carrier, its officers or agents, subject to this act to use any locomotive engine propelled by steam power in moving interstate or foreign traffic unless the boiler of said locomotive and appurtenances thereof are in proper condition and safe to operate in the service to which the same is put, that the same may be employed in the active service of such carrier in moving traffic without unnecessary peril to life or limb."

In 1915, Congress became aware that the locomotive boiler and its appurtenances, were being inspected and repaired at the expense of the machinery, and that the machinery with which the boiler was connected, and which is essential to the successful operation of the railroads, was being neglected, and that a large number of accidents were occurring, due to the failure of such parts.

In consequence of this, the Locomotive Boiler Inspection Act, of February 17, 1911, was amended, and made to include the entire locomotive, and the authority of the Chief Inspector, the two Assistant Chief Inspectors, together with all of the District Inspectors, appointed under the Act, was extended, so that they should have the same powers and duties with respect to all the parts and appurtenances of the locomotive and tender, that they formerly had with respect to the locomotive boiler and its appurtenances.

It will easily be seen, from these enactments, that Congress has had in mind, for the past 81 years, the conservation of life and limb, and has placed it above any financial consideration.

The Locomotive Inspection Act applies to all common carriers engaged in the movement of interstate traffic by railroad, its officers, agents and employees; therefore, each of you gentlemen, and the craft which you represent, is vitally interested in the requirements of this Act, not only from a standpoint of safety for those with whom you come in daily contact, but from a legal and moral viewpoint as well; and it, therefore, becomes your duty, as officials of the carriers, in supervising the work of others for whom you are responsible, to see that the laws, rules and instructions for the inspection and testing of locomotives and tenders and their appurtenances, are fully complied with, so far as they come within your jurisdiction. It has been said by some, however, that this is and has been inefficient and ineffectively administered.

A comparison of the fiscal year, ending June 30, 1912, which was the first year of the existence of the Locomotive Boiler Inspection Law, with the fiscal year ending June 30, 1918, the last year for which we have a full report of the accidents and casualties which occurred, due to failure of the locomotive boiler or any of its appurtenances, will show, we are pleased to state, that there was a reduction of 54 per cent. in the number of such accidents, a 60 per cent. reduction in the number of persons killed, and of 49 per cent. in the number injured, due to such failures.

Comparison of the data of the first 10 months of the year ending June 30, 1912, with the first 10 months of the year ending June 30 next, shows a corresponding reduction, which, we believe, is the result of the enforcement of this Law. This reduction in the number of accidents and casualties is phenomenal, in consideration of the enormous increase in traffic and the strenuous circumstances under which the railroads have been operating, and the disadvantages and hardships to which they have been subjected, brought about by the War, and could have been achieved in no other way than through the sincere co-operation of you gentlemen and those who are responsible for the operation and repair of locomotives.

The interest displayed by the great army of railroad employees who were called upon to keep the highways of transportation open, during the greatest crisis through which the world has ever passed, and their loyalty to this great Government, which they have so faithfully served, has unquestionably been as effective and as necessary to the cause for which we were struggling, and for the victory which has been attained, as was the army that fought in the trenches, and is, therefore, entitled to as great praise.

The Act of February 17, 1911, provides a penalty for the violation of the lawful order of any Federal Inspector, or the violation of the Act itself or any Rule or Regulation made under its provisions, and it is indeed gratifying, to be able to state that, since the effective date of this Act, it has not yet been found necessary to appeal to the Courts, to inflict this penalty.

It has been the purpose of this Bureau to co-operate with the officers and employees of the carriers, to the fullest extent consistent with the duties of those in charge of the execution of this law in bringing about the purpose for which it was enacted, and it is my desire that the same spirit of co-operation, which has heretofore existed, may continue. If the proper spirit be shown, by those responsible for such inspection and repairs, I can assure you that this same spirit of co-operation will continue, but, if we find a spirit of indifference and evasion, and the proper inspection and repairs neglected, it will be our purpose to use every authority, conferred by law, to compel a proper compliance therewith, and, if need be, the assistance of the Courts will be asked to impose the penalties provided for in Section 9 of the Act; and, where the roads are under control of the United States Railroad Administration, a personal responsibility will be required to be fixed, and discipline applied, as provided for in the Director General's Order No. 8, which supersedes the penalty, before referred to. However, I desire to assure you that I sincerely hope that it will never become necessary to insist upon the application of any penalty. The incentive to avoid injury or death to our fellow beings should be sufficient, to encourage everyone to his best efforts. The law places the burden of responsibility, for the proper inspection and repair of all locomotives, upon the carriers, and makes the work of this Bureau, and its inspectors, supervisory, in its nature. With approximately 70,000 locomotives in service, on more than 250,000 miles of railroad, it would be impossible for the 50 inspectors, provided by law, to inspect and supervise the repairs on any great number of them. Therefore, it becomes an obligation, upon the officers and employees of the carriers, to perform their duties, as required by the law and rules, in a conscientious and effective manner.

Our only purpose, and the purpose for which the law was enacted, is that of *Safety,* and when we have obtained safety, we have obtained efficiency; when we have obtained efficiency, we have also obtained economy. All three of these should be striven for unceasingly, by those upon whom such great responsibilities rest, as they do, upon the railroad employees of this country, who are responsible not only for their own safety, but are, in a very large measure, responsible for the safety of the great traveling public, whence comes the means of their subsistence, and from which source must eventually come the revenue to meet the expenses incurred in the operation and maintenance of these great highways.

He who serves well in his chosen profession, be it ever so humble may justly be said to serve best. Each individual who serves any useful purpose, is an essential cog in great wheel of Time, and I believe that the greatest satisfaction that one can have, when he is called upon to meet the Great Hereafter, will be the knowledge that he has served to the best of his ability, and that the world has been bettered, by his having lived.

Gentlemen, I desire to again express my sincere appreciation of this opportunity of meeting with you, and of having this privilege to thus address your Association. Wishing you every success that should be attendant upon every useful individual, I thank you.

THE PRESIDENT: Mr. Pack, I take pleasure in thanking you, in behalf of the Master Boiler Makers, for your admirable address. It will be helpful to the organization.

MR. PACK: I thank you, Mr. President, and I want every member of your organization present to feel that I am one among you. It is my greatest desire to do good rather than hinder. (Applause.)

THE SECRETARY: Possibly all the older members of the Association noticed the absence of the official chaplain, Mr. John H. Smythe, Past-

President [illegible] and, if I am not mistaken, this is the first convention he has ever missed. He has just been put in charge of the boiler department of a new plant and could not get away. He desires his very best wishes and kindest regards extended to every member of the Association, with his regret that circumstances over which he had no control made it impossible for him to be here.

The President: We will now take up the first topic in the program, "What Should be the Minimum Distance Between Grates and the Lower Part of Arch Tubes for Different Classes of Locomotives, etc.?"

REPORT OF COMMITTEE ON

"What Should be the Minimum Distance Between Grates and the Lower Part of Arch Tubes for Different Classes of Locomotives? What is the Proper Distance From Door Sheet to Brick Arch for the Various Classes of Locomotives?"

The minimum distance between the grates and the lower part of the arch at the throat sheet for different classes of locomotives depends upon the local conditions; that is, as to the grade of coal they are using, whether it fills up badly or not; whether the firemen have been taught to shake grates and keep the fire worked down. We have a great many engines which have as a minimum distance eight inches, and the railroads are getting along very successfully with it, but as said before, this is a local condition depending upon the coal and the way the firemen fire the engines.

In regard to the proper distance from the door sheet to the top of the brick arch and from the crown sheet to the top of the brick arch for the various classes of locomotives—this also is a local condition. We have run arches in a great many cases as close to the crown sheet as 11 inches, with good results, but there are some railroads that insist that the arch shall not be closer than 16 to 18 inches.

The distance from the door sheet to the top of the arch is a very varying distance, depending upon the length of the firebox. The arch should be run as long as possible in all cases and the top of the arch should be up higher than the top of the door.

As stated above, there is no hard and fast rule for these distances; hence it is difficult to give any condensed statement on it.

L. M. Stewart, Chairman

INDIVIDUAL REPORT OF MR. E. W. YOUNG

Taking up the first of the two questions, viz; "The minimum distance between grates and the lower part of arch tubes for different classes of locomotives."

It is really impossible to set any figure as an answer to this question, as so many variables must be taken into account. What would be a minimum figure for one railroad, would not be the minimum figure for some other railroad. What would be a minimum figure for a certain shape of firebox, would not be the proper minimum figure for some other shape of firebox, even though the locomotives may be of the same class.

The distance from the grates to the lower part of the arch tube may be less with a throat sheet that sets back at an angle from the vertical than for a throat sheet which is vertical.

The distance from the grates to the lower part of the arch tube may be less in the case where the grate is flat, than in the case where there is a steep toboggan pitch of the front end of the grate.

The distance from the grates to the lower part of the arch tube may be less in a short firebox than in a long firebox.

The distance from the grates to the lower part of the arch tube may be less in a compound locomotive with its mild draft than in a simple locomotive with its sharp draft.

The distance from the grates to the lower part of the arch tube may be less with one grade of coal than with some other grade of coal.

On account of the variable conditions, it is impossible to set any figure for this feature. A good rule and a simple one may be stated as follows: Locate the arch tubes as high above the grates as the design of the firebox will permit.

In some cases this has meant that the arch tubes have had to be located as near as eight inches to the grate, and yet satisfactory results have been accomplished; however, better results will be obtained if the throat sheet be such that the distance of 18 inches can be obtained between the grates and the arch tubes.

In regard to the second question of the subject, viz; "What is the proper distance from the door sheet to the brick arch in various classes of locomotives?"

It is just about as difficult to say what shall be the answer to this question as it is to answer the first question. One answer to this question might be stated as follows: "The brick arch should approach the door sheet as near as possible without restricting the area between the arch and the door sheet, to a figure below the gas area through the flues." It is very seldom, however, that we find a case where the arch can be run as close to the door sheet as the above solution would dictate, due to the fact that under such a condition the gas area between the arch and the *crown sheet* is unduly restricted by approaching the door sheet so close. It might be stated that an arch may be built back to within 24 inches of the door sheet, provided conditions other than the relation of the arch to the door sheet will permit.

A good rule in connection with arch designs is that an arch should be as long as conditions will permit, and it is usually the case that these conditions must be studied from two or three angles before we can decide just what the length of the arch shall be, or what the distance shall be between the arch and the door sheet.

We think you can appreciate the fact that it has always been the case that arches have had to be designed to be placed in a firebox, already designed. It would be very much easier to get an ideal arch if the arch were first designed and then the firebox built around it. If the latter condition were the fashion, it would be very easy to answer the two questions, and they would read about as follows:

No. 1. The grates should be placed 18 inches below the front end of the arch tubes.

No. 2. The door sheet should be placed about 24 inches from the back end of the arch.

It should be understood, however, that the above two specifications can rarely be made use of for the very reason that arches are built into fireboxes instead of fireboxes built around arches.

Arch tubes must be so located in the flue sheet that there will be access to the front end of the arch tube through the waterleg. In order to get this access through the waterleg, and through a plug hole in the outside throat sheet, arch tube locations are often found to be impractically low and in such instances the special spacer block is used to elevate the front course of arch brick, so that practical firing clearance is obtained.

Following you will find the distances on the different type of locomotives used on the Chicago, Milwaukee & St. Paul Railway, also those used on the United States Standard Locomotives. You will note at a glance the various difference in distances.

CHICAGO, MILWAUKEE & ST. PAUL RAILWAY.

Type	Distance between grates and lower part of arch tube	Distance from door sheet to brick arch
I-5	13½"	45½"
G-4	18"	37"
A-1	16"	49"
A-2 Straight top	13½"	53½"
A-2 Slope top	14"	44½"
B-4 Wide firebox	14½"	64½"
B-4 Narrow firebox	11½"	67"
G-6	13"	46"
K-1	24"	59"
L-2	23½"	49"

U. S. Standard Locomotives

060	10″	28″
0B0	10″	37″
4- 6-2-A	13″	53″
4- 6-2-B	15″	47″
2- 6-2-A	13½″	52″
2- 8-2-B	15″	47″
4- 8-2-A	15″	46″
4- 8-2-B	15″	42″
2-10-2-A	14½″	42″
2-10-2-B	15″	59″

E. W. Young,
General Boiler Inspector,
C. M. & St. P. R. R.,
Dubuque, Iowa.

The use of syphons in the place of arch tubes will, in very many cases permit of considerable better firing clearance, than can be obtained where arch tubes are used. There may be many cases of firebox construction, in which an arch on syphons will be practical, while arches on arch tubes would be impracticable.

Syphons make a good foundation for a brick arch, and on account of their being so substantial they make a practical device to take the place of arch tubes. This may be getting away from the subject, however, there are so many features connected with this, that I am sure it will be interesting to the association.

We have on the Chicago, Milwaukee & St. Paul Railway engine 7615 equipped with these syphons, which have been in service about six months, and which are giving excellent results, showing increase in efficiency and a large saving in fuel. Arrangement is now being made to apply these syphons to several different classes of engines.

Following is an extract taken from the report of test, which gives the result of the test for an engine equipped with the syphons and brick arch, over an engine of the same class equipped with arch flues and brick arch.

In order to determine the merits of the device, engine 7615 Class C-2 was equipped with two Nicholson Thermic Syphons, and tested out in road service against engine 7142 of same class, equipped with a standard arch supported on arch tubes. Both engines had recently undergone shopping for heavy repairs, the 7615 having been in service about six weeks at the time of the tests and the 7142 for about ten days. In order to avoid all possible error in coal and water weights, the same tender, of known calibration, was used in all tests. The weather conditions were good and uniform throughout the tests.

The locomotives tested were of the saturated consolidation type with piston valves and Walschaert valve gear, and alike in all respects except that the firebox of 7615 was equipped with the Nicholson Thermic Syphons supporting the brick arch, while engine 7142 had the ordinary type of arch supported on four three-inch arch tubes. The principal dimensions and data are given below:

LOCOMOTIVE DATA

	Eng. 7615	Eng. 7142
Cylinder diameter and stroke	23x30"	23x30"
Drivers diameter	63"	63"
Tractive power, lbs	42,800	42,800
Weight on drivers	190,400 lbs.	189,200 lbs.
Total weight of engine	216,900 lbs.	215,700 lbs.
Total weight of engine and tender.	351,450 lbs.	350,250 lbs.
Boiler type	Straight R. S.	Straight R. S.
Boiler diameter first course	75¾"	75¾"
Grate area, sq. ft.	48.8	48.8
Tubes number and O. S. diam.	414–2"	418–2"
Tube heating surface	3,143.0 sq. ft.	3,173.4 sq. ft.
Normal firebox heating surface	195.7 sq. ft.	195.7 sq. ft.
Heating surface added by arch tube		29.3"
Heating surface added by Thermic Syphon	53.0 sq. ft.	
Total firebox heating surface	248.7 sq. ft.	225.0 sq. ft.
Total heating surface	3,391.7 sq. ft.	3,398.4 sq. ft.
Total heating surface area	69.5	69.6
Firebox heating surface	7.3%	6.6%
Firebox heating surface	5.1	4.6

The tests were run over the 90-mile section of the Chicago, Milwaukee & St. Paul Railway between Milwaukee and Portage, Wis. The train loads averaged around 2,250 tons on the adjusted tonnage basis, the time consumed per trip being about seven hours. After four complete trips with each engine, there was observed and computed the following essential data, affording a comparison between the two engines, and indicating the extent to which the "Thermic Syphons" served to improve the performance of the engines to which they had been applied. The numerical values applying to engine 7142 and the non-syphon engine, are taken as 100 per cent. in each case.

Results of Tests

	Eng. 7142	Eng. 7615	Differ. Per cent.
Pounds coal fired per gross 1,000 ton mile actual	124.36	93.64	24.7
Pounds coal fired per gross 1,000 equated	124.36	86.63	30.3
Pounds coal fired per locomotive mile	271.9	218.9	19.4
Average tonnage hauled	2190	2340	6.8
Pounds of water used per gross 1,000 ton miles	670.72	596.22	11.1
Pounds of water evaporated per pound of coal fired	5.39	6.36	18.0
Equivalent evaporation per pound of coal fired	6.54	7.74	18.3
Equivalent evaporation per pound of dry coal	7.28	8.60	18.1
Equivalent evaporation per pound of combustible	8.37	10.49	25.3
Boiler efficiency	57.65	73.75	27.92
Front-end temperature degrees	6.25	5.50	13.6

Coal Consumption

Eng. No.	Test No.	Total lbs. coal fired	Average lbs. coal fired per hour	Lbs. coal per square foot of grate per hour	Coal fired per 100 car mile	Fired per 1000 motive mile	Lbs. Coal fired per gross 1000 ton mile
7615	1–E	48,400	3,262	66.84	382.8	206.7	80.60
	2–W	20,450	3,903	80.00	689.0	222.7	102.84
	3–W	20,820	3,523	72.19	513.7	226.8	101.35
	4–E	19,505	3,744	76.72	317.6	219.1	91.61
	Ave.	19,734	3,599	73.75	440.6	218.9	93.64
7142	1–W	29,450	4,558	93.40	486.0	320.8	162.12
	2–E	22,100	4,300	88.11	483.9	248.3	108.22
	3–W	25,855	4,568	93.60	638.1	281.6	141.51
	4–E	20,930	4,120	84.82	461.1	235.1	94.10
	Ave.	24,534	4,401	90.18	510.8	271.9	124.36

From this and other data and observations pertinent to the tests, the following conclusions were drawn:

Engine 7615 equipped with the Nicholson Thermic Syphons and carrying an arch, showed a reduction of 24.7 per cent. in actual pounds of coal fired per gross 1,000 ton mile as compared to a sister engine 7142 equipped with a standard arch supported by four arch tubes.

Engine 7615 showed a saving of 30.3 per cent. in coal fired per gross 1,000 ton miles with coal equated to a common B. t. u. basis.

Engine 7142 worked with an average boiler efficiency of 57.65 per cent., which is a fair performance considering the design of the boiler, rate of combustion, and quality of fuel.

Engine 7615 with the syphons had an average boiler efficiency of 73.75 per cent., an increase of 27.92 per cent. over engine 7142.

Engine 7615 used 11.1 per cent. less water per 1,000 ton mile.

Firebox Evaporation. The marked reduction in fuel consumption, and increase in boiler efficiency shown in the foregoing tables warrant some explanation, for it is evident that a mere increase in firebox heating surface of some 23.7 square feet is not of itself sufficient to cause such a showing. The improvement is due rather to the shape and location of the syphon and the arrangement of its heating surfaces with respect to the flame contents of the firebox.

The reduction in the front end temperatures indicates that the firebox of engine 7615 absorbed a greater proportion of the total heat generated than did the firebox of engine 7142. The amount of water evaporated by each of these fireboxes can only be determined accurately by actual and rather expansive tests: but it can be approximated in the following manner:

Knowing the temperatures of the gases entering the flues at the firebox end, the temperature of the gases leaving the flues at the front end, and the weight of the gases passing through per hour, the evaporation from the flue heating surfaces can be obtained. This amount subtracted from the total evaporation will give the firebox evaporation.

As no front end gas analyses were made, the amount of air supplied per pound of coal fired is unknown, but under similar conditions as to grade of fuel, rate of combustion and type of grates, numerous locomotive test plant records indicate an average air supply of 10½ pounds of air per pound of coal, at the rate of combustion of 73.75 pounds of coal per square foot of grate per hour, for engine 7615 and 9.75 pounds of air per pound of coal at the rate of combustion of 90.18 pounds for engine 7142.

The use of the syphons affected an indicated reduction in front end temperatures of 75 degrees with indications that future tests will probably show greater drops in this temperature.

Combustion of the gases in the firebox was seemingly improved by the combination of the syphons and brick arch.

Engine 7615 was remarkably free from smoke at all times, and discharged less cinders than engine 7142. The syphon heating surfaces had an indicated evaporation approximately 50 per cent. higher than other heating surfaces in the same firebox, and 100 per cent. higher than firebox heating surfaces of engine 7142.

E. W. YOUNG,
General Boiler Inspector, C. M. & St. P. Railway.

Made Sectional for Easy Removal

SECTIONAL

To meet practical boilermaking conditions the Security Arch was made in small sections.

A practical boilermaker designed this feature. He knew its value in staybolt inspection and renewals and flue work.

Only a few brick need be removed to work on flues and staybolts.

That's why the Security Arch was made in small, easily handled pieces.

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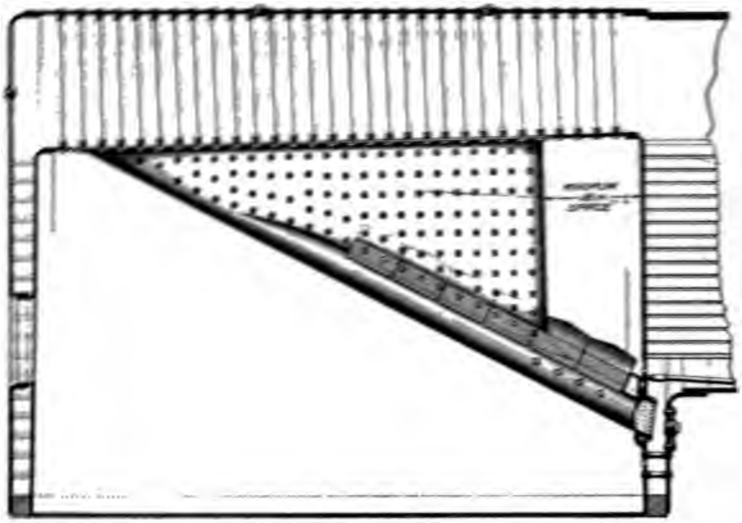


THE NICHOLSON
THERMIC SYPHON

Increases the boiler capacity by increasing the firebox heating surface and taking full advantage of the heat imparted by direct radiation from the flames.

Increases boiler efficiency by promoting combustion; by increasing circulation; by increasing the amount of heat absorbed; and, by reducing front-end temperatures and the attending heat losses.

Reduces boiler failures and repairs by increasing the circulation throughout the boiler; maintaining uniform temperatures at all points and reducing unequal expansion and contraction.

Provides a substantial brace for the crown sheet and a substantial support for brick arch or baffle walls.

LOCOMOTIVE FIREBOX COMPANY

Marquette Building, Chicago, Ill.

DISCUSSION.

Mr. Young: The minimum distance between the grate and the lower part of the arch tube should be all that the design of the firebox will allow. In the distance from the door sheet to the brick arches of various classes of locomotives, I think the arch should extend at least to the height of the door hole and not too close to the crown sheet.

Mr. C. R. Bennett: Is any one present who can give a good reason for designing and building locomotive fireboxes to suit brick arches?

Mr. John F. Rapps: When the committee agreed upon the subject of brick arches, the idea was to learn whether anyone had made tests to determine the opening which should be left in proportion to flue or grate area. It is the same as the front end discussion, absolutely no rules at the present time.

Mr. Harthill: Put the brick arch four inches below the lower end of the lower tube, within two thirds of the length of the firebox; see that the area from the crown sheet to the top of the brick arch is 15 to 25 per cent greater than the area of the flues, and a fair basis to start from will be gained. We have found that on different locomotives it comes nearer to that standard than anything else.

Mr. Borneman: Application of the arch is dependent upon the size of the firebox.

Mr. Berry, of the Grand Trunk: In putting up the brick arches, should they be fitted right up to the flue sheet and the side of the firebox?

Mr. Harthill: I am an advocate of putting the brick arch up tight against the back flue sheet.

Mr. Whalen: Setting the arch back according to the American Arch Brick Company's method, about five inches from the flue sheet, and keeping the fire well underneath, will give the best results.

Mr. Young: The proposition of placing the brick arch against the flue sheet is a local condition and depends upon the class of fuel you are using. You may get along fine by keeping the brick arch away from the flue sheet, or the inside throat sheet, on a combustion chamber engine. No trouble may occur.

Mr. Nimmo: We made some tests of brick arches. When the opening between the crown sheet and top of the brick arch was the same as the area of the flues, it caused the radial stays to leak. Given 10 per cent more than the flue area eliminated trouble.

Mr. Borneman: How can a brick arch cause leakage of radial stays on a locomotive boiler with ample space and the amount of water carried on the crown? The water does not boil sufficiently to rise from the sheet and stays become overheated. My experience has been in some of the hardest water districts of the country, including Texas and Nevada where the water is pure alkali. We also have very hard water in our western district which caused considerable trouble, part of it, however, being due to boiler washing. We have many engines equipped with brick arches. None give trouble from leaky radial stays owing to the arch brick.

Mr. Walla: The last speaker works in good water and has had nothing to do with bad water. If he will come to Sioux City I will show him "why." (Laughter and applause).

Mr. Austin: I agree with Mr. Young in regard to the distance of the arch from the flue and crown sheets. Local conditions govern the practice. Less flue area between the crown sheet and top of brick arch is sufficient in good water districts; but when you have light water, and especially in fast passenger service, the water is carried low in the boiler to keep it from going over into the cylinders. There is danger that when the throttle is closed it will drop to the bottom of the water glass, or perhaps out in the forward part of the boiler. The crown sheets at times are exposed, and remain so as long as the brakes are retarding. This condition being produced several times during each trip, cause the radial stays to leak, and later on bulging of the crown sheet between the stays. The only remedy is to make more of an opening between the crown sheet and top of the arch, this being another case where local conditions govern.

As a general proposition we should not hesitate to recommend that the distance from the top of the arch to the crown sheet be from 18 to 20 inches. The arch should be up tight against the flue sheet. The minimum distance between the grate and the bottom of the arch should be not less than 12 inches.

Locomotive fireboxes should be designed as far as practicable to carry a big arch. While we know that fireboxes are not built so that brick arches may be applied, the arches are profitable, and provision should be made for them.

Evidently the committee has gone to considerable trouble and has presented a good report. Their recommendations seem to be pretty well along general lines, even though they may vary an inch or so from our ideas. In the main, however, they have established a good general standard and which this Association should approve. If it is in order I move that the standard recommended for placing brick arches in locomotive fireboxes be approved.

PREVENT LOCO BOILER EXPLOSIONS

BY

"Adopting Wood's Safety First Devices"

WOOD'S FLEXIBLE FIRE BOXES

don't break staybolts and are 8 **times** stronger than boxes made with rigid flat plates

New York Central Test, No. 907, of December, 1909

Government Report guarantees the use of WOOD'S boilers and shows, by series of tests on 10 sheets, a saving of 7 per cent in coal during test of 4 years.

WOOD'S boilers were never out of service during the test, only at shopping times.

REGULAR boilers running against them were out for repairs from 2, 4 and 6 weeks at a time, between their shopping time.

Pacific Type of Boiler, with WOOD'S Fire box and Combustion Chamber, drawing by Baldwin's, shows 20 per cent of extra heating surface. Additional heating surface which guarantees 15 per cent saved in coal.

Wake up Mechanics and assist the Government to save the country's coal which is being wasted.

22 per cent of the production of coal in 1917 was burned up in locomotives.

15,000,000 tons of coal can be saved annually by standardizing WOOD'S Fire Boxes and Tube Plates.

Railway Review, Page 7, Issue, Jan'y 4th, 1919, illustrates United States Government Standardized Locomotives, Types 2-10-2 and 2-8-2 with Boilers, Rigid Type, having 346 square feet of heating surface in Fire Boxes.

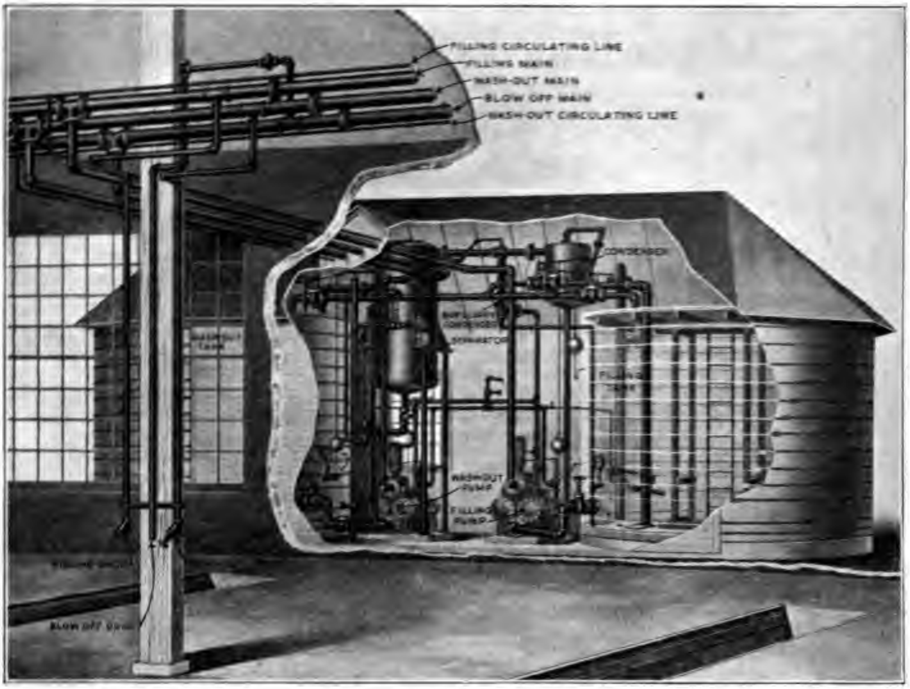
QUESTION: Would it be better if 20 per cent surface was added to the Fire Boxes, if they were made flexible, if 800 less stays were used, and if strength to the boiler was added 8 to 1?

See new patented Hydraulic Press for corrugating WOOD'S complete Fire Box, after being bent up and heated. Capacity 50 per day.

See New York Railroad Club Report, Vol. 24, 1913-1914, Pages 3459 to 3478 and 3572 to 3578.

THE WM. H. WOOD
LOCO FIRE BOX AND TUBE PLATE CO.
MEDIA, DEL. CO., PA.

NATIONAL HOT WATER LOCOMOTIVE BOILER WASHING SYSTEM



Don't Rupture Your Locomotive Boilers by Washing a Hot Boiler With Cold Water

The National Locomotive Boiler Washing System—
Uses the blown-off water to wash with
Uses the steam from blown-off water
to heat fresh water to fill with

NATIONAL BOILER WASHING COMPANY

Railway Exchange, Chicago

Hot Water and Steam Heating for Railway Terminals
General Piping Contractors

In order to avoid criticism about building the boxes to suit the arch it would seem well to slightly change the phrasing so that it would read "That the bottom of the arch should be a certain distance from the grate and the back end of the arch should be a certain distance from the door sheet."

Mr. Young, of the Southern Railway: Placing a brick arch against the combustion chamber on a mountain or Santa Fe type engine has a tendency to keep the ashes, etc., from flooding the combustion chamber. We have obtained very good results on several engines by placing the first row of brick against the combustion chamber.

The President: We have with us Mr. R. H. Aishton, Regional Director of the Northwest, whom now I take pleasure in introducing. (Applause.)

ADDRESS OF MR. R. H. AISHTON.

Mr. President and Members of the Master Boiler Makers' Convention:

That is some title you have for your Association. That is pretty nearly as bad as the one I have been carrying around for a year or two. (Laughter.) I am mighty glad to see you here in Chicago. I understand your convention is the biggest you have ever had in your history, and that you had to adjourn yesterday because you did not have a room in the Sherman Hotel big enough to take care of you, and go to a theatre. I do not know any other convention of railroad men that ever accomplished that stunt here yet; that is going some. (Applause).

I am mighty glad to know that you think so much of Chicago and our reception to the veterans of the 133d Regiment today, which is going to start in the course of an hour and a half. If you fellows from out of town want to see a real sight, I suggest you adjourn about 11:30 and go over and see it and help welcome the boys home. (Applause). You know I have been at conventions before and I know how tired a fellow gets along about 11:30, listening to talk about brick arches and flue sheets.

Somebody said I was going to make an address. I am not going to do anything of the kind. I have a hard cold for one thing, and then somebody told me that to be a good boiler maker, you have to be hard of hearing. With a cold myself and your constitutional deficiency in hearing you know I can not talk very long and reach you. But seriously we do appreciate the value of these conventions, such as you are holding here today, especially as it is a general convention representative of all the railroads. I doubt whether, under the old condition of things, such a meeting as this would have been possible; yet I do distinctly hope for all these conventions, the Boiler Makers, Blacksmiths, the Superintendents —yes, and I will say the Presidents of the railroads—they have conventions sometimes—I hope that if what the President says comes true and we get our railroads back to operating our own way the first day of next January, that what has been established in getting all these minds together and discussing these things will be possible after the Government relinquishes control, if they ever do that. (Applause).

I have been a big believer in meetings of this kind. I have been intimately connected with the American Railway Association for the last 20 years—ever since I came to Chicago; I have been mixed up in all the Superintendents' Associations, and General Managers' Associations, and Presidents' Associations, and now we have a Regional Directors' Brotherhood—there are only seven of us. (Laughter and applause). We even hold a meeting about once a month and go over things, and I give you my word that I never came from any meeting of any kind but what I felt that I secured a distinct measure of education on the particular subject that was being discussed; and I know from having operated a railroad about 40 years, or being connected with it, that every man on a railroad is better for attending these conventions and listening to the discussions, even if he does not agree with them. Why, the educational feature of it is very valuable indeed to the road he is connected with.

Now what advice can I give you folks? I don't know anything about a boiler. I do know, however, that a boiler is the whole heart of a railroad, because, without locomotives the railroad could not run, and without a boiler a locomotive could not run, and as I see it, you men in this room can do as much to promote the efficient operation of these railways as any other single set of railroad men in the service. Why, if your locomotives are not in good conditions, if you are having engine failures on the road and it is due to something you or your men have neglected and you fail to see to it, what happens? The railroad stops. There isn't anything more expensive, unless it is a head-end collision. than an engine failure on a railroad. I used to have a pretty busy division where everything was inter-laced, so that unless everything moved just so, the whole thing got balled up. Night after night when we had a blockaded condition on both ends of the road, and when the whole operation of the road depended absolutely on getting 100 per cent performance out of every locomotive, I have seen the train dispatcher claw his hair and damn the master boiler maker from hell to breakfast. (Laughter and applause.) Of course the railroad problem, (and I will say the Government's problem, because that is who I am working for today, and the Government's ploblem is my problem)—well, it is a good deal like having an engine, you know, with 21 feet, 6 inches between the front and black flue sheet, and a 21 foot flue to fit in there. That is just about where the railroads are today. In other words, our expenses are fixed and they are a certain amount, and our earnings are not equal to filling the gap. What are you fellows going to do? You got a flue six inches short and have to fit it in at both ends of the flue sheet. What do you do? You weld on a piece. That is exactly what must be done with the railroad situation; we have to weld on a piece, and the length of the piece means the amount of additional earnings we must have in order to take up these terrific expenses. It depends somewhat on your efforts and on your ability to conduct your work that the railroads and the Government—and when I say the railroads, I mean the Government now—that you get as near 100% efficiency out of every locomotive you let out of your shops, as possible, in order that the expenses on the one hand may be cut down, and the piece we have to weld on the flue to meet the flue sheets is no larger than necessary. For every inch that you put on that flue sheet out of whose pocket does the dollar come? Out of you! Everything you buy, a pair a shoes, or a suit of clothes for the kids, or something that goes on your table, means you are going to pay part of that transportation cost; there is no getting around it. You are the people that have to pay it. It is a small amount, but there never was a time when the railroad officers, such as you folks here, and the Regional Directors and all those people, ought to work more in concord, in order to eliminate all these extraordinary costs and get as near 100% out of the railroads, as right now, because any deficiency will come squarely back on ourselves.

We are good American citizens. We are interested in keeping the cost down why should we not be? There are a hundred ways in which which you can help. I know a few of them, because Quayle told me. (Applause.) I profess to know a lot about the railroad business, but there are a lot of things I don't know, and boilers is one of them; but I do know there are two axioms in the railroad business; one is to get the maximum of steam with the minimum of fuel—that is your job; the other is, to get the maximum of tons per mile of train haul, and that is my job. I will attend to my end of it; I want you folks to attend to yours, and I know you will. How can you do it?

I went through a round house the other day and saw some fellows cleaning flues; they went about half way through the flue, did not go from the front to the back end, didn't go through it at all; the flue was half cleaned; I saw it myself. Who was responsible for that? Why, it was not the poor cuss that was cleaning those flues; it was the foreman who was watching that job; he is the fellow who was really responsible, just the same as I am responsible for it, because I am supposed to be responsible for everything that happens on about 150,000 miles of railroad, but I have to depend on some of you folks to do part of it. In the matter of super-heaters. A super-heater put in a locomotive today, costs about $2,600, I believe, and yet I know, because I have an expert who looks after those matters and reports to me, that on one road, through the improper cleaning of those super-heater flues and pipes, through their being allowed to accumulate ash and soot, etc., one third of the extra efficiency of the super-heater engine was lost; in other words, there was one third of $2,600 on that engine that was not earning any money. That was not right. See that your fellows cleaning those super-heaters can keep them clean, because we get a return on it then; we do not put them on for ornaments—the engine looks better without the super-heater.

On one railroad last week the fingers on the grates taken out of an engine in the shop were all burned off. I asked, "How long have they been burned off?" They did not know—they "were that way when the engine came in." Every minute a grate is used in that condition, coal is dropping through from which the railroad administration gets no benefit, and it is paying about twice as much for fuel as it did a year and a half ago. Isn't it worth saving? The cost of the grate is infinitesimal as compared with the coal that is continually going to waste under bad grates.

When I came in here some gentleman was wisely expounding about brick arches. I do not know whether a brick arch is worth a whoop or not; maybe it is not; if we decide to keep on putting in brick arches, I do not know anything more important than to maintain those brick arches properly, and the brick arch isn't any god at all when it is down in the firebox, mixed up with the coal, where I have seen it many times. If arches were maintained properly, we would not have that condition on the road. It means that you have to cut 400 or 500 tons out of a train, and maybe set the train on a side track and run in light—and that is awfully expensive now. We used to spend half our time cleaning the outside of an engine, when all the trimmings were brass. Now we have painted them black and don't have to polish them up, but I hope we wont do the same thing with the inside of the engine and the boiler that we have with the outside. It ought to be cleaned. The arch tubes ought to be cleaned.

Then there is another thing, I understand—Quayle tells me this too; he tells me two things are very abhorrent in the railroad world; one of them is the vacuum in a fellow's brain box, and the other, and next most important thing, is the lack of a vacuum in the front end. The lesson is very obvious. I have seen engines with leaks in the front end; I don't see the vacuums in the brain box always, although we generally find them out in the course of time; but as I ride over the road, there are many times when I can see smoke coming out of the front end—in between the cracks, and I know that where smoke gets through, air will get through, and there is no vacuum. You, and not I, are discussing how to bring it about, but I know that if all the locomotives in the United States had absolutely complete vacuums in the front ends, we would be able to increase the train tonnage and train movement of freight in this country something like eight to 10 per cent. That looks big, but just take the train movement and earnings and figure what that would mean in money and how far it would go toward offsetting the deficit of about $280,000,000 last year; I don't know what it will be this year, but every little helps. Now that is all the expert knowledge I am going to talk to you about. (Laughter.) I have a real long string of it, but I do not want to leave that with you.

We are in a period of reconstruction and one of the biggest jobs the United States has is reconstructing these railroads. I do not mean reconstructing them physically; I mean putting them back on their feet so they can go ahead and manage their business, and pay their wages and do the things that are absolutely necessary, and run them themselves, because I am one of those fellows who believes that a body of men like this and a body of men like the men who have been in charge of these railroads know a great deal better how to operate the railroads and how to run them than any central administration possibly can do. I believe that the future of the railroads lies in the development of individual initiative on these railroads in the future as in the past. With that problem we have the problem, as I say, of your flues not being long enough, and a weld will have to be put in. I ask every one of you men to keep that in mind, and in your work and in your superintendence over the work, just keep in mind that every dollar wasted, every bit of inefficient work that goes out of the shop under your charge, means a charge against you, a charge against me, and a charge aginst the people of the United States, because the bill must be paid. I ask you, as good American citizens, and loyal railroad workers, to go back to your homes with the determination that so far as possible every bit of waste will be eliminated, to the end that we can render the people of this country efficient transportation service. I thank you. (Applause).

THE PRESIDENT: Mr. Aishton, I take pleasure in thanking you in behalf of the organiaztion, for the honor you have done us.

MR. AISHTON: It is a very distinct pleasure, gentlemen, for me to come over and meet with you. (Applause.)

DISCUSSION OF BRICK ARCH RESUMED.

THE PRESIDENT: We will now take up the subject of the brick arch again. Does anyone else wish to speak on it?

MR. WINTERSTEEN: I do not think the brick arch, no matter how high it is, will make crown bolts leak so long as mud is kept off the crown and plenty of water on it. I never worked for the Pennsylvania Railroad, but when I became a locomotive inspector of the Inter-State Commerce Commission, in 1911, I made inspections on that road and looked into a couple of fireboxes, and at the crown sheet. The foreman asked what I was looking for. I said "leaky crown bolts." He said: "You won't find them." I replied: "Not unless you look for them." He said: "I will give you five dollars for every leaky crown bolt you find." I hunted for a leaky crown bolt, on the Pennsylvania for more than a year, and did not find any. They have the "D-16" class of locomotive, which did not have a brick arch—at that time—and never had a leaky crown bolt. Later, the arch tubes and brick arches were applied to these fire boxes. Shortly after, one could occasionally find a few crown bolts leaking, about the center of the firebox or directly over the top of the arch. Several master mechanics and foremen with whom I talked could give no reason, except that the brick arch was too high, and not suitable for that style of firebox. At Wilmington, Del., one day, a locomotive came in hot, with a leaky and loose stud in the boiler. After the fire was dumped and the boiler empty, I found the brick arch still red hot. I believed, then, that this had something to do with crown bolts leaking, as it was a common practice to blow out a locomotive immediately, on arrival at the engine house from the ash pits. I examined the crown sheet, which showed no sign of leaks, but was very hot. After the stud was renewed and the boiler refilled, I found about 28 or 30 crown bolts leaking. I mentioned this at this time to show that the brick arch is often blamed for leaking crown bolts which are really due to oversight, neglect, or carelessness.

MR. NIMMO: The test made in my territory was with a new boiler from the Baldwin Locomotive works and no scale was found on the radials or sheets. The radials will leak or show indications of leakage if the opening between the crown sheet and the top of the arch is smaller than the area of the flues.

MR. WINTERSTEEN: You can not burn a crown sheet if it is kept clean and if water is kept on it. I can prove it.

MR. NIMMO: The same results may be had from an oil burner whenever the heat is concentrated on the crown sheets at a given point with a back end burner and a brick arch. It will make the crown bolts leak and with button head bolts I have known them to burn off in 120 days.

This is the first time I have talked in a convention. Heretofore, I listened to other people who did all the talking. Their views differed from mine. Hereafter, I intend to express my opinion. We have had more than 700 members at this convention. If the majority would express their opinions on the various subjects they would be of more service to their employers. We would then gain more information. As a general proposition the master boiler maker is a man who does things and is not a debater.

THE PRESIDENT: That is what we are here for.

MR. WINTERSTEEN: With all due respect, that is what we come here for, "to have our say;" that is what we want members to have.

MR. C. R. BENNETT: The brick arch should be designed to suit the firebox—the shell of the boiler, taking into consideration the horse power required of the boiler. Then design and build the brick arch so as to get the best results. The distance from the brick arch to the crown sheet should be governed by the class of locomotive, and controlled by the officers of the terminal to which the locomotive is assigned, in order to avoid leaking at the crown stays. A brick arch properly designed and properly applied and maintained will save fuel and help keep up steam pressure. To put the arch too close to the crown sheet will cause the crown sheet stays to leak, whether the water used is good or bad. The best way to get good results from a locomotive with a brick arch is to take into consideration the design of the locomotive from front to back, as well as the air space of the ash pan; also the kind of water and coal used and whether the railroad is over level or hilly country; then apply the arch as instructed, follow it up the same as other matters are followed up on the locomotive, and whenever defects are noted, make changes in the arch to suit conditions. Perfect results will then be obtained from the brick arch as well as a saving of labor and fuel. Expansion and contraction in the firebox will be overcome to a certain extent. That will overcome firebox leaks which would occur if no attention were given the arch and which is the cause of the trouble in many cases.

Superheater locomotives in our passenger service have brick arches in the firebox and we were having a great deal of trouble with the flues becoming filled with slag as well as becoming clogged inside the flue, requiring the flues to be cleaned upon arrival at the end of each trip. To overcome this, we maintain our brick arches to suit these conditions; we leave out two or three brick at the top in order that we may be able to get the flues cleaned out by means of a long flue auger rod.

Some of the brick arch representatives state that if asbestos gloves are worn, the brick can be removed, the flues cleaned and the brick again placed in position. This is not true, however, so far as our terminal is concerned. We find the brick have become so firmly united that we are unable to remove them without breaking them out. When this is done new brick have to be applied. We find that the clogging of the flues causes us trouble and expense in addition to abuse to the firebox on account of the engine failing to steam. By leaving out two of the brick in the top row so that the flues can be more readily cleaned with the longer auger, we over-balance the difference of not properly applying the arch.

MR. MURRAY: I think the gentleman is just right.

The President: Other parts of this topic have not been touched on—"the proper distance from the door sheet to the brick arch and from the crown sheet to the brick arch, for various classes of engines" and how far it should be from the grate?

Mr. T. F. Powers: We have men here who have never attended one of our conventions—especially boiler foremen from different round houses. They know more about a brick arch and how it ought to be set, in a minute, than a shop man knows in a week. Some of them tell me about bunk handed out here. I want them to get up and express their opinion now and not afterwards. (Laughter.)

Mr. Churchill: In our territory Fuel Supervisors regulate draft appliances and brick arches. We have been experimenting with brick arches. When combustion chamber engines were received the arches were set four inches from the throat sheet, extended back two-thirds of length of the firebox, and within 26 inches of the crown sheet. On one engine we tried a perforated arch but the results were not satisfactory. We have combustion chamber engines which now have seven-inch brick. The arch is seven inches from the inner throat sheet. The results are more satisfactory and I am told there is quite a saving in fuel. On engines without a combustion chamber the arch sets five inches from the flue sheet, extending back about two-thirds of the length of the firebox and about 28 or 30 inches from the crown sheet. On our combustion chamber engines the distance from the flue sheet to the door sheet is about 17 feet and the flues are 21 feet, 6 inches. So it is necessary to take out brick to clean the super-heater flues with a blower extending the full length of the flues. Brick must be removed on non-combustion chambers in order to clean the bottom flues.

Mr. R. C. Young: The condition of the heating surfaces on the water side is of importance. If covered with scale the efficiency of these surfaces in conducting the heat would be reduced.

Mr. Austin: The committee has made recommendations which seem to be pretty well along general lines. I move the adoption of the standards for placing brick arches in locomotive fireboxes. In order to avoid criticism about building the boxes to suit the arch, I would change the phraseology. That part which says the grate should be placed 18 inches below the front end of the arch tube, should be changed to read "The arch should be placed 18 inches above the grate." The next paragraph says the door sheet should be placed about 24 inches from the back end of the arch. I think the arch should be placed 24 inches ahead of the door sheet. That is the only change I would recommend in the phraseology, but I would like to see this convention become an authority and adopt a standard.

Mr. H. J. Wandberg: With good water an arch can be run up high and no boiler trouble will occur. With light and foamy water the arch must be lowered in order to keep the crown sheet dry, but there must be openings on the side or the staybolts will leak all the time and will not last.

Mr. Jacob: When we added an additional row of brick on each side, grates did not burn out so constantly and less fuel was burned, the saving being four tons on a run of 150 miles. Then another row was put in with still better results. It convinced me that it is better to use your head and make tests than to follow any fixed rule.

Mr. E. W. Young: It is impossible to adopt a fixed standard. It depends on local conditions. The report gives a good and simple rule. It says: "Locate the arch tube as high above the grate as the design of the firebox will permit." When possible grates should be placed 18 inches below the front end of the arch tube—the door sheet. Owing to engines differing in design a standard cannot be adopted. The door sheet should be about 24 inches from the back end of the arch.

Mr. Miller, of the Virginian: Local conditions govern. I tried the arch with a back flue sheet. No standard can be established with so many different engine designs.

Mr. Steinbuck: We were troubled with clinkers accumulating in the flues back of the flue sheet. It was overcome by fitting the arch tight against the sheet ceiling. We use seven-inch brick in our arches on engines burning lignite coal.

Mr. J. O. Crites: An investigation I made on the central division of the Pennsylvania railroad disclosed that flues were not properly cleansed with a blow pipe which serves the purpose of an auger. On most of our engines the blow pipe can alone be used and is intended to drive out either clinker or coal lodged between the flue and superheater pipe. If the auger pipe is not put all the way through the pipe, soot and sparks may be blown out and clinker remain on which sparks will light when the engine is fired up, and soon after the flue becomes entirely closed. After the men doing the cleaning were checked up the flues were properly cleaned and we have had better results. All the gang leaders are required to watch these men and see that their work is done right. As we have many kinds of fireboxes arches are put in to suit them. Some are shallow and others deep. If very shallow there must be a good opening or the front end will be clogged.

Mr. Arthur E. Brown: Only a few years ago the brick arch was subject to condemnation. Today we realize that that was a mistake. The brick arch is essential for fuel economy, and the generation of steam. The design of a locomotive boiler should cover a proper appliance for a brick arch. If crown bolts are properly applied, the threads and the fit given proper attention, and there is no superfluous material in the head of the bolt, I do not believe the effects of the fire would be shown upon it if sufficient water was on top of the crown sheet. Some railroads, our own included, are making very large crown bolt heads. That is wrong. There is a standard design of bolt from 1⅛ inches to whatever you would require. The object is to get that bolt as strong and durable as possible. Guard against superfluous material, one of the main things that would cause the bolt head to leak.

I am firm in the belief that the arch should be applied to this particular design of a boiler, closely inspected, and followed up, to obtain the best results. As to another design, with the same rules prevailing, and so far as the distance of the arch from the back head is concerned, circumstances would govern. As to the distance from the brick arch, from the grate to the flue, we want an arch as low as we possibly can get it from the flues, but we have to keep in mind the space between the grate and the bottom of the arch. Other circumstances would alter the real location of the arch in order to get the best results. Thank you. (Applause.)

Mr. Mackey: This is the first time I have attended a Master Boiler Makers' convention. I am surprised that so many Master Boiler Makers are now going through the experimental stage in brick arches. On the Santa Fe, we went through the experimental stage about eight or nine years ago. I have two kinds of coal under my supervision, and handle possibly 100 engines. If a brick arch is run from the flue sheet with the Gallup coal we burn honey-combing cannot be prevented. Eight years ago by running the brick arch close to the flue sheet, honeycomb was absolutely cut out. We have another kind of coal that does not cause it. We can run the brick arch away from the flue sheet or close to it. In a number of our large heavy power engines the arch tubes are not more than 10 or 12 inches from the grates. They are so designed that only two tubes carry the brick. Possibly 12 or 15 tubes are exposed below the arch. We have to renew 50 or 100 of the bottom flues every six or eight months. If not exposed, we run them two, three or four years. If a brick arch is run up to the crown sheet and heat concentrated on the sheet too intensely, the sheet and crown bolts will be heated and leak just the same as when with a boiler full of water an oxyacetylene torch is applied on the crown bolt.

Mr. Wintersteen: Mr. Mackey compared the coal he uses to the oxyacetylene torch. If it gives as much heat as the torch it must be mighty good coal.

Mr. G. W. Bennett: I move that the report be accepted and the subject closed.

A MEMBER: I do not believe this convention is ready to adopt the report. The discussion has shown that the maintenance of a brick arch in different districts depends upon local conditions and should be so handled. Before we go on record in accordance with the motion, we should have it understood that we believe in it; but no such opinion has been expressed.

MR. A. N. LUCAS: The brick arch proposition is a local matter and should be taken care of at each terminal. We have to bear in mind that we change round house foremen and boiler maker foremen frequently, as well as the brick arch and flue men. To keep your system standard, this matter must be continually kept before them. On the Milwaukee line east, there were 1,500 engines. We have had no new power for the last eight or nine years. We certainly ought to understand how the brick should be handled. We are receiving new United States power, and it will again require some practice or some test to know what we can do with Mikados.

MR. CALLAHAN, of the Bird-Archer Co.: Recently I inspected six Mallet boilers of the Western Pacific Railroad. They are the only oil burning engines in the United States, I am told, that use brick arches and arch tubes. People who question the use of an arch in an engine can readily see what that would mean in oil. An arch tube and an arch brick in an oil burning engine is something out of the ordinary. They figured that they needed the brick because the uneven heat would cause loose staybolts and radials. After putting in brick arches they did not remove an arch tube in two years. The flues are in excellent condition. Brick are not used on their cross seams or door sheets. The first set of brick lasted more than six months. They had no occasion to make comparisons of the economy of oil against what an engine would use that did not have the brick. The results were considered marvelous.

MR. WHALEN: In view of statements concerning oil burning engines made at the fuel conservation meeting here last week by Eugene McAuliffe, Mr. Callahan's remark that the Western Pacific is the only road using brick arches in such engines is erroneous. On our Mikado type, with the quality of coal burned, we cannot succeed with the arch against the flue sheet. Mr. Kilcoyne, of the American Arch Company, told me a few weeks ago that some roads used arch brick within 6 or 12 inches of the door sheet, practically cutting off the draft and putting all the heat against the door sheet in the crown sheet. With a good quality of coal, if the brick arch is run within a radius of 12 or 15 inches of the crown sheet, heat is concentrated at that point. Constant contraction and expansion, due to cold air rushing in when coal is applied to the fire, will result in leaky radial stays. For this reason we discontinued brick on our 10-wheelers with a corresponding improvement. It was formerly my opinion that crown bolts would not leak unless the engineer had low water, but if they never have low water, it must be the design of the arch, or mud on the crown sheet which we try to keep clean. I believe, like one member of our committee on the paper, and as has been said, local conditions govern, and to get the best results the adjustment of the arch must conform to the design of the engine.

Mr. Thomas F. Kilcoyne: To correct Mr. Whalen's statemnet relative to long arches approaching the door and crown sheets. I had reference to perforated and not solid arches. Mr. Whalen misunderstood me.

Mr. Strinsky: We have only oil burners. We put in our first brick arches about three years ago, and are now putting arch tubes in oil burners. If applied the same as in a coal burning engine radial stays would soon be burned out as there is a difference of about 500 or 600 degrees in the heat. We are putting arch tubes in all our engines and have no trouble.

Mr. C. M. Klink: When a change is made from one grade of coal to another draft appliances must be changed. The draft plate is sometimes a factor. On our K-1 class engines we use fire brick about 45 degrees from each inside throat sheet. Only one engineer out of 10 can help you design the steaming qualities of his engine. When an engineer cannot help you in a local terminal, you must work out your designs. Your orders are to maintain engines from the same standard. You cannot run a railroad and let every division have its own standard. It is an old saying, "between two evils choose the least." We had a traveling engineer who reported an engine not steaming. He recommended, "Shoving the arch down solid against the throat sheet." I forgot it. He went out that night on the same engine and on his return reported the engine steamed satisfactorily. It is the local condition with which we have to deal. Set your design and work as near to that as you can. Keeping honey-comb off of radials and soot and cinders off the arch, will result in less leaking of radials and a clean crown sheet.

Mr. Bennett's motion to close the discussion was put to a vote and carried.

THE PRESIDENT: We will now take up the report of the committee on the Proper Threading of Radial Stays.

REPORT OF COMMITTEE ON

"The Proper Method of Threading Radial Stays and Tapping Holes for Same. Is it Necessary to give Radial Stays the Same Lead as the Tap with which the Holes were Tapped?"

The theoretical way to thread a radial stay is to make its thread align with the tap with which the holes in crown and roof sheets are tapped.

Rigid experiments have proven that no better results are obtained from this method than where no attention was paid to the alignment.

This is due to a slight variation in taps and threading machines and the tendency of the tap when tapping the roof sheet to assume a radial position in relation to roof sheet.

A practical method of tapping the holes is to use a double ended tap. However, good results are obtained with single ended spindle taps.

It is very necessary that the tapping and applying of radial stays should have the same consideration as stay bolts in side sheets. The holes should be tapped with a suitable length tap so as to make a continuous thread. Radial bolts should be threaded in a machine equipped with a lead screw. If this is done there will be no trouble with entering bolts in crown sheet, on stripped threads.

H. J. RAPS, Chairman.
J. J. KEOGH

DISCUSSION.

MR. H. J. RAPS: Bolts are made in the lathe and in the horizontal bolt cutter. One is just as good as the other. Bolts cannot be interchanged from one hole to the other. The bolt without the lead is as successful as the one with the lead, and costs less.

MR. BORNEMAN: Have you any leaky radial stays? If Mr. Raps can get along without having the threads match in the crown and the sheet, it is something in boiler construction with which I do not agree. You may trust yourself, but you can not trust everybody else.

MR. A. N. LUCAS: If we intended to order a boiler built, we would certainly advise the manufacturer very strictly that the bolts had be in pitch with the tap.

The President: They do not pitch.

Mr. A. N. Lucas: They should pitch. We are discussing the proper method of having them in lead.

Mr. Thomas F. Powers: We cut our bolts in a machine that is accurate, but how many of us know that we maintain our tap and lead? Not half a dozen of us are tapping these holes for bolts with a long tap.

Mr. H. J. Raps: We did not adopt this crown bolt in a hap-hazard way. We made some very rigid experiments and adopted the bolt as the most successful as well as the cheapest. We also found that where the alignment of the holes in roof and crown sheets was not radial with the roof sheet that the tap would spring and assume a radial position. The greater the variation the greater would be the springing of the tap. So great is this tendency of the tap to spring that a snug fitting bolt screwed in from the outside will not align with the hole in crown sheet.

Mr. A. N. Lucas: In tapping out a set of radial stay holes in the crown sheet and roof sheet with a set of taps composed of 1, 2, 3, and 4, the short bolts are applied first. The bolts for tap No. 1 are cut in the machine to that tap, and the same with No. 2, because the taps differ, they are not all in pitch with each other.

Mr. Powers: Do you make your bolts before you tap your hole, or afterward? There may be a difference in some taps before and after tapping the hole, due to the strain put on either the motor or the machine.

Mr. A. N. Lucas: I would not think so.

Mr. Powers: I know it, because I have tried it.

Mr. A. N. Lucas: We cut the large end of radial stays first. We have a small adjustable die on the bolt cutter, put the tap in the machine, in the head, and adjust the die back of the job to the tap. Then the small end of the bolt is cut. The tap can then be tried and will be found perfect.

Mr. C. P. Patrick: I have experimented with threading button head crown and radial crown bolts, and have never found that a proper lead could be obtained on any stay bolt, whether the bolt was cut in a lathe, or threaded in a bolt cutter. The thread in the bolt may be correct, but not in the tap or in the sheet. Several years ago while passing through a certain shop on our railroad one of our special shop demonstrators said, "We have a new lead screw, and are cutting our bolts in proper lead." At the machine was a wheelbarrow full of bolts just threaded. I picked up three bolts and not one would match with the taps. Recently I visited a shop where I presume as good stay bolts are made as anywhere—certainly with the finest thread I ever saw anywhere. They had a thread gage with which to match up the threaded bolts. Being told that the bolts had the proper lead, I said, "I will bet you they haven't." The gage was applied and they would not match, but would screw in the same as any bolt. I have had crown bolts turned up in a lathe and followed down with the tool from end to end, and the threads would sometimes cross. I have had upset end radial stays threaded first one end and then the other. They went in easier than those with the threads cut on the lathes. I do not believe there is anything in a lead when applied to stay bolts. Certainly a thread will not be out of the way more than a 24th part of an inch—"half a thread." When tapping out a crown sheet in a wagon top, the sheets will spring more than 1/24-inch. I believe it is a loss of time and money to consider a lead on a stay bolt when trying to make the threads match.

MR. WALLA: I have never seen a machine on which a gage or a tool can be put after a bolt is made—or a tap either—that will come true to within one thousandth of an inch. If a man taps radial stays in a crown sheet—two sizes, with the larger size on the bottom—it is absolutely impossible to get them to gage.

MR. AUSTIN: Mr. Patrick has given the common sense, practical view of the matter. With so much useless theory about the lead screws, especially for radial stays, it is not worth while to bother about it.

MR. SHUMAKER: All who want to try a tap, ought to take a trip through the Baldwin Locomotive Works. More holes are tapped there in one day than by an average railroad in a month, and they cut a bolt a mile away from where they tap the hole. Bolts are cut by the thousand nearly a month before the holes are tapped, but they do not strip any bolts. I cut mine on a lathe. I might strip one in 25 or 40 or 50. I was at the Baldwin works twelve months. They build about 65 locomotives in a week and do put a trim on a bolt. Three may be cut and none be alike.

MR. STEWART: In my experience there is nothing at all in the lead on the radial stays; it is just an expense and a very slow, costly proposition.

MR. ELKINS: Some years ago we tried to follow the idea of a lead by traming the taps and cutting the stays from the line on a screw machine; but we had all kinds of trouble before and after putting them in. We now tap the holes with two separate taps, using a guide bar to make sure that the holes are in line, cut the threads on the bolt cutter, cutting the top end a shade loose and giving the bottom end enough tap to make a perfect fit and are not having any trouble at all. We do not strip one bolt in 100.

The President: My practice was to put the bolts in the crown and roof sheets, make them steam fit in the other sheet and drive the crown stays and radials on the top. I never had one leak.

Mr. Wintersteen: Give us an estimate of how many crown bolts you have driven and never had one leak.

Mr. Walla: Mr. Lucas meant new bolts.

Mr. Wintersteen: They also leak.

Mr. J. T. Mitchell: Are we discussing flexible radial or rigid stays?

The President: Rigid.

Mr. Mitchell: On the Colorado and Southern, 1⅛ inches, top and bottom, is standard. I believe it is the same on the Burlington.

The President: Yes, for new work.

Mr. Mitchell: Formerly, with a new firebox, they put in a straight bolt from the outside. We are compelled now to put in a bottom head bolt. According to the standard of the engine, it is a rather peculiar job, when both holes have to be made the same size.

A Member: What is your experience?

Mr. Mitchell: Tapping the holes from the outside. The outer holes have a tendency to be larger than those inside if the holes are given a double ended tap. The vibration of the tap and the weight of the motor would cause one hole to be larger than the other. On the Colorado & Southern an extension tap with a sleeve on one end is used. The tap is run in from the bottom and through one hole; then pushed up to the top holes, and a threaded sleeve screwed in the bottom hole with a set screw to line up the threads. The hole is then tapped and the tap run right through on the top or back of the tap or taken out at the bottom.

A Member: Have you measured the holes.

Mr. Mitchell: No actual measurement has been made.

A MEMBER: On the Rock Island, the tap was originally made solid. The bottom holes were tapped first, the bolts being upset on the bolt machine. As the crown sheets came down, four or five rows were put in the top of the sheets to hold them up. Bolts were cut 12 inches long with 12 threads to the inch, and the results were satisfactory.

(Recess.)

AFTERNOON SESSION.

PRESIDENT LUCAS: The subject before the house when we adjourned was the radial stay.

On motion the report was ordered printed in the Official Proceedings and the discussion closed.

THE SECRETARY: Invitations for the next convention have been received from fourteen different cities. It is customary to refer these to the Executive Board, which selects the time and place.

THE PRESIDENT: Referred to the Executive Board.

The next regular subject is "Fuel Economy," George Austin, chairman of the committee.

REPORT OF COMMITTEE ON

"Effect of Proper Upkeep of Ash Pan and Front End Draft Appliances on Fuel Economy"

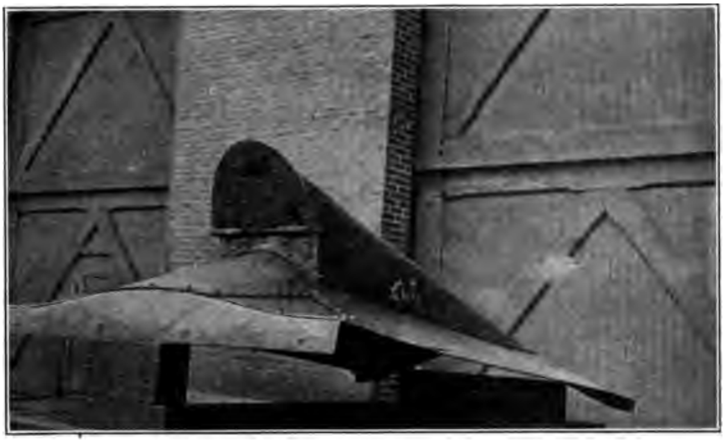
and

"Methods Used in Determining Proper Design for Various Classes of Locomotives"

Your committee has failed to locate a recognized rule for designing ash pans. The result of our investigations indicates that methods are largely the result of experiments which have developed designs which seem best suited to the type of locomotive and condition of service. The objective to be attained was a self-cleaning arrangement of sufficient storage capacity to prevent the necessity of dumping the ashes except at regular ash pan cleaning points; and to prevent the cinders from burning and warping the pan. The lower parts are designed to be practically air tight, air for draft being admitted at the upper parts only. Ash pan air inlets of eight classes of locomotives averaged 14 per cent. of grate area which, from information obtainable, seems to be about the average air opening in ash pans for coal burning engines.

With the modern wide firebox pans are made wide at the top, projecting several inches beyond the mud ring with vertical sides to prevent sparks from falling or being blown out by side winds. These upper plates are sloped toward the hopper or storage part so that cinders will slide to the hopper. There seems to be a tendency to sacrifice this slope to obtain greater draft opening, which has resulted in some instances in the cinders piling up on the wings and shutting off the draft, as well as causing stuck grates and burned grates and connecting bars. Therefore, we believe that the slope from the hopper to the edge of the pan should be not less than 30 degrees and rather than lose this slope, it is better policy, if possible, to get increased air opening from back or front.

We have stated the objective points to be attained in designing ash pans, and wish to suggest that when locomotives are being designed, that the ash pan should be considered and provided for as being an important part of the machine, and not as something to be hung on after the locomotive has been set up. The modern ash pan is expensive to construct and still more expensive to maintain, and the greatest possibility of improvement seems to be in the designers who may find it practical to change the frame lines or other parts sufficiently to give relief where it is greatly needed.

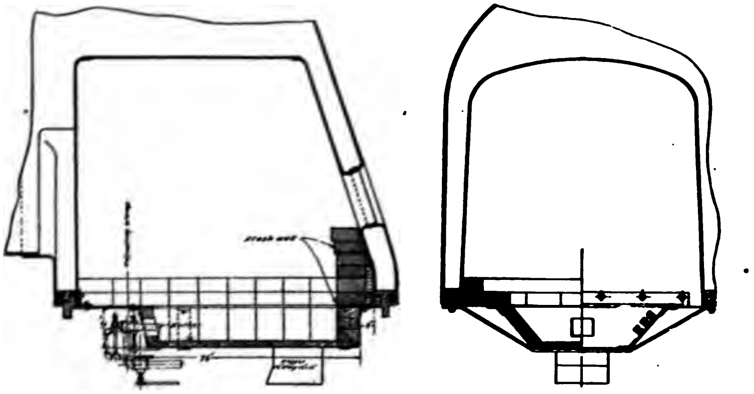


Your attention is called to the photographs of what is known as the Madden ash pan. This pan, you will observe, is simple in construction, has no hoppers, and is less liable to warp, and the work of keeping ash pan hopper slides and dumps in operative condition is greatly reduced. This pan seems to be growing in favor. It is reported to this committee that there are 700 of them in use on one road. Mr. Thomas P. Madden, General Boiler Inspector of the Missouri Pacific Railway, and the Fourth Vice-President of this Association, is the patentee of the device. The application and adaptability of this pan largely depends on the room which is left by the designer of the locomotive to apply an ash pan.

MAINTENANCE OF ASH PAN.

Slides, hoppers and dumps should be maintained in an operative condition. Grates should be maintained in first-class condition. Broken, burned, or warped grates should not be allowed in service. One bad grate often causes damage to a whole section, also waste of fuel and damage to ash pan.

No air openings should be allowed in the ash pans except those provided for in the design. This is particularly important in case of oil burning locomotive draft pans, for the reason that air leaks permitted at other points than those designed usually result in brick work troubles as well as interfering with the proper steaming of the locomotive. A sketch of an oil burning pan is presented for the information of those who are not familiar with oil burning locomotives.



Oil Burning Fire Pan Arrangement.

Air leaks at lower parts of coal burning locomotive ash pans are, as you all know, extremely undesirable and annoying, not only on account of burning and warping plates of ash pan, but particularly on account of sparks dropping and causing fires along the right of way, it being a mooted point whether fires set from locomotives are not most frequently from the pans rather than the stack.

Front End Draft Appliances.

Method of determining design of front end draft appliances has, no doubt, as its basic principle, what was known as the Master Mechanics' front end, and like other parts, constant experiments and experience develop a type of front or setting to suit the conditions.

All parts of ash pan and front end appliances should be carefully fitted and securely bolted in place so that there is no reasonable probability of any part becoming displaced, and should be maintained at all times in first-class condition, each part performing its full function strictly in accordance with the design. We particularly refer to draft openings and passages which govern the flow of air and gases through the firebox flues and smoke arch. Dampers which are designed to be operated should be maintained in an operative condition and air be admitted only at such points as the drawings provide for. Draft passages should be maintained so that all the drafts will pass through those channels, which is not the case if loose or poor fitting plates are allowed. To illustrate: Draft appliances, which include deflecting plates, nozzle petticoat pipe and stack, may be designed and adjusted to thoroughly clean cinders from front ends, and because plates were not well fitted, leaks direct to the stack were sufficient to defeat the object of the design, causing cinders to accumulate in the front end, sometimes resulting in burning and warping front end rings and doors and overheating lower joints of exhaust and steam pipes and developing leaks at those parts.

Front End Leaks.

Your committee is of the opinion that positively no air leaks should be permitted and that where front ends show indications of burning on account of the combustion of cinders, it is just as often the result of poor fitting plates and air leaks as it is of faulty design or of wrong adjustment of draft appliances. We also incline to the opinion that we should make use of the autogenous welding process to secure permanently to the smoke arch and flue sheet a suitable sheet iron border to which to bolt deflecting plates. This border may be spot welded when being applied or welded in solid. At any rate, it can be an absolutely tight fit, in fact, air tight, if desired. An arrangement of this kind will expedite the work of applying or removing deflecting plates and simplify front end inspection.

There are many ideas as to the type of, and adjustment of, petticoat pipes, and your committee naturally hesitates to give expression to their opinion on the matter, and it will perhaps suffice to state that petticoat pipes should be maintained to practically a true circle free from holes or indentations, and be securely held in central position between nozzle and stack.

As an item of interest to this Association, and to give an idea of general dimensions of draft openings, the following is given. We find in eight different classes of coal burning locomotives the following comparative dimensions of draft passages:

Eight Coal Burning Locomotives.

Ash pan air inlets equal 14% of grate area, or 39.5% of grate opening, and is 4% more than flue opening area, the flue opening area being about the same or slightly less than ash pan air inlets, and about one-half of the area of grate opening. From this it would appear that pan opening and flue opening are practically the same, while stack area is about 10% of flue opening area.

Seven Oil Burning Locomotives.

Have same stack opening and flue opening and grate area. They have no grates, but the air inlets through the fire or brick pan, also called the draft pan, are 28% less than the flue opening area and are 69%, or a little more than twice the stack opening. The comparatively small air openings to the fire in oil burning engines compared to coal may raise the question of whether or not we are allowing too much air to the coal burner, especially with a clean fire. We are of the opinion that the size and location of these openings have been worked out principally by experimental process and, while perfection may not have been attained, when we observe a good steaming oil burner at work one is pretty apt to conclude that there is not much room for improvement.

The effect of proper upkeep of ash pan and front end appliances is to save fuel and maintaining a high standard of condition of those parts saves labor, and effects an economy.

Like many other economies which can be effected in any line of business and yet not be reducable to plain figures, we must accept the above statement because we know that well maintained draft appliances and ash pans do fully perform their functions of furnishing the necessary drafts for economical combustion of the fuel and prevent fires being set out and the destruction and loss of property, which is an important economical consideration. That well fitted and well secured parts of the draft appliances reduce the liability of displacement and failure on account of not steaming and loss of fuel due to poor steaming, also reducing the necessity of constant changing of front end draft appliances, which is another considerable economy, and finally, well maintained draft appliances may well be considered the difference between a satisfactory, efficient locomotive, which everyone appreciates, and a poor steaming inefficient machine that no engineer wants to run. With respects of the committee,

GEO. AUSTIN, Chairman.

DISCUSSION.

MR. AUSTIN: I wrote to each member of the committee, asking for their views, and with their help and what information I could get this report was prepared. We lacked time to have it signed by all the members of the committee but all are interested. Local conditions govern nothing more completely than the regulation of front ends or the upkeep of ash pans and draft and spark arresting appliances. The committee did not attempt to recommend or criticise any method of drafting a locomotive. They did not attempt to criticise any method or system of arrangement of front ends, although familiar with the fact that there are many opinions as to which is the best type, the best style of a petticoat pipe, or whether the deflecting sheet should be back or in front of the steam pipes. We know that some people believe the petticoat pipe is more of an obstruction than a necessity. It is a fact that some locomotives, both coal and oil burners, can be successfully operated without it.

Enough time in which to get sufficient data was not afforded but we have given the percentage of air openings in the ash pan compared to the grate, flue and stack openings. Possibly we are going to extremes in providing air openings on ash pans; that was brought out or presented itself, when we compared the air opening of the ash pan of a coal burner, with that of the draft pan of an oil burner. It seemed possible, with a newly built fire in a coal burning locomotive, that too much air is admitted when a trip is begun, with a possible loss through carrying too heavy a fire at that time as an offset to the later gain when ashes begin to restrict the flow of air through the grates.

MR. POWERS: Did the committee make any investigation in regard to preventing air leaks around the super-heater pipes and front end steam pipes? It is one of the biggest bones of contention we have on our road, and I think that is a point it might be well to bring out.

MR. AUSTIN: The committee made no investigation of that particular phase. We find that packing mixed with boiled oil that will not get too hard, is better than a packing that is liable to dry up and powder out. If you can get a packing that is in a gummy state, it is better than the other kind.

MR. LEWIS EBERLE: We cut a plate that fits right around the steam pipe, and butt them together in the electric weld, in the meantime putting in some front end cement.

MR. POWERS: Do you not find that the front end cement hardens, crumbles, and falls out?

MR. EBERLE: That is what you want; front end cement will not crumble and fall out.

MR. C. R. BENNETT: We have had trouble with super-heater locomotives due to air in the front end where the steam pipes pass through the smoke box to be attached to the cylinders. Our method of locating it was to hold a lighted torch at the bottom of the jacket covering the steam pipe. If not air-tight the flame of the torch would be drawn up between the jacket and the pipe. We have overcome this by placing a jacket around the flange collar on the smoke box, having the bottom of it clamp tight around the flange of the steam pipe by a band with bolt to be drawn tight. The jacket is welded to the flange collar on the smoke box. The job is absolutely air-tight and will remain so. We apply another jacket from the cylinder to the bottom of the band that holds the top jacket. This is intended merely to cover up the exposed part of the steam pipe connection on the cylinder. The collar on the smoke-box has a false bottom, in two pieces. After the steam pipe is in place, false bottom is replaced and asbestos packing applied with an additional plate on the inside of the smoke-box, fitting tight around the steam pipe as well as being bolted tight to the smoke-box sheet.

Mr. T. F. Powers: As an experiment we have been mixing tar with front end cement. We put a band around the bottom end of the steam pipe, where it goes through the sleeve, to hold the outside, and then packed this cement down tight between the joints. On the inside we put a piece of No. 10-heater iron, fitted around the steam pipe, using the bolts that go through the casting to hold it in place, and making a tight joint on both ends of the steam pipe collar. We have not gone into this sufficiently to know what it is going to do. I believe by putting a collar inside and outside, it has not much chance to get away.

Mr. Whalen: That idea was threshed out thoroughly at the Fuel Convention last week. Mr. McAuliffe said that by fixing the steam pipe in the described manner, absolute tightness is practically assured.

Mr. Powers: I was interested in what Mr. Bennett said about casting the collar on the steam pipe. Did I understand him to say that the collar was cast or pressed on the steam pipe.

Mr. C. R. Bennett: The steam pipe has a pipe with a hole in it and two flanges. The flanges project about 3 inches. The steam pipe, we will say, is 6 inches in diameter, and allows about 6 inches for flange; that is about 12 inches in diameter. The clearance is about 3 inches all around the smoke-box, which means that it will be about 16 inches in diameter. That end is welded electrically or with acetylene or gas, bringing the collar down on the steam pipe and clamping it tight. It will be air-tight.

Mr. Johnson: On the Santa Fe and the Coast Lines, we use a mixture of crude oil, sand and asbestos for packing. It takes care of all expansion and excludes leakage of air around the pipes.

Mr. Young, of the Southern: We use a mixture of asbestos, coal oil, lamp black, with linseed oil to harden it. This is put between the casting and the collar. Our plates fit in two half circles, snug around the steam pipe to keep the exhaust from pulling it out. We fixed up 18 engines that way. Recently I found casing and collar outside, where they are supposed to put asbestos, still taking air, though the inside packing was tight. It is a mystery to me.

Mr. Porter, of the Chicago & Northwestern: We use a rope asbestos, braided and tamped in, and flake asbestos mixed with a front end cement. It is not a permanent packing but it stays longer than when mixed with asbestos alone. It can be braided and tamped in, with fairly good results; I do not mean 100 per cent., because that is out of the question.

Mr. Stucki: In 1917-1918, super-heater units were leaking on the Baltimore & Ohio. My boss was anxious, wanted to know the reason, and I found that the outside steam pipe had a large clearance between the smoke-box and the cylinder, which we packed with a mixture of asbestos, sand and Portland cement and the leakage was stopped. It was all due to air in the front end.

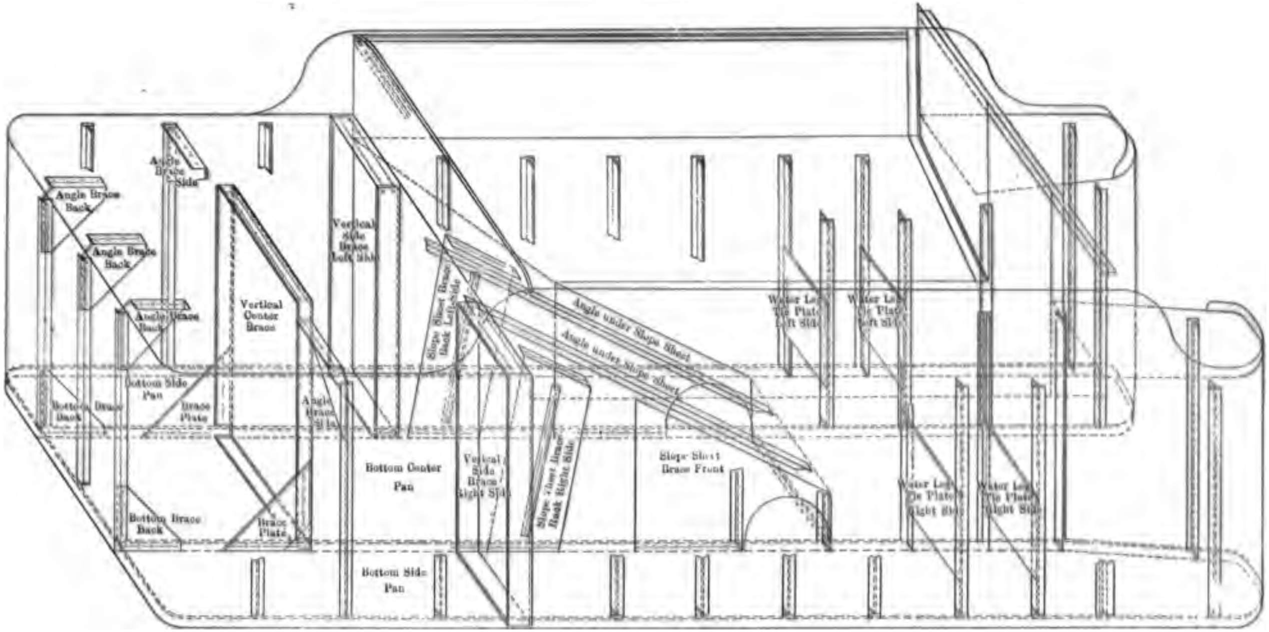
Mr. W. R. Barnes: I am from a section of the country where the conditions are somewhat different from those I have heard discussed in the convention today. I heard the discussion on the brick arch this morning, and deviating a little from the present topic, I would like to say that the Central of Georgia has tried every arch that has been discussed.

The President: We will have to hold to the subject. The arch question is settled.

Mr. Barnes: I will confine myself to the subject. We have tried several types of draft appliances and ash pans, and have as the standard, what is known as the Master Mechanic, and are getting very good results. The ash pans are of the hopper type with slides or drop bottoms on the larger power, with openings around the top and in some cases in the sides of the pans. We have made a great many experiments along these lines. It has been my experience that the best results in service from any device are secured by having the men who are to handle same, familiarize themselves with the appliance. The Master Boiler Makers may devise new plans, do all they can by way of improvements, make experiments with draft appliances and ash pans or any other part of boiler and appurtenances, for the betterment of the service and economy; but unless they get the men that handle them to understand their purpose and advantage, and handle them accordingly, the best results will not be obtained. (Applause.)

Mr. Elkins: The grate proposition is of vital importance in the operation of locomotives. An engine with grates partly burned out or in bad order is certainly not efficient. The grates and ash pans should be so designed that the engine will be given the proper amount of air and should always be maintained in good condition. This also applies to the draft appliances in the front end. We must also have the co-operation of other mechanical men for, if the nozzle steam pipes and smoke stacks are not properly designed and maintained, all of our work will have been in vain. Flues cannot be kept tight nor the engine be made to steam if there are leaky steam pipes or nozzles. On the Missouri Pacific we have adopted what is known as the Madden ash pan. It has proven very cheap and efficient. When we were using hopper ash pans we renewed them about annually. Now we run a pan about four years and our people are very well pleased with the results.

Mr. Powers: Is there any difference between cast iron and sheet steel pans. On the Northwestern we use the sheet steel pan and burn



STEEL ASH PAN

out quite a few. I have seen a number of ash pans built with a cast steel frame.

Mr. G. W. Bennett: What Mr. Powers speaks of I am able to show in a blue print. I anticipated his wants in advance. This is a cast steel pan, adopted by the New York Central lines. More than 1,000 are now in service. According to the records, they are a decided improvement over the sheet steel pan. Some have made more than 300,000 miles, and are today in as good condition as when applied, having had no repairs whatever. They are being tried out on the Pennsylvania, Baltimore & Ohio, Michigan Central, Chesapeake & Ohio, and the Boston & Albany.

The cast steel pan is composed of 59 pieces, while the sheet iron, sheet steel or built-up pan has 2,459, including nuts, bolts, washers, etc. Comparative statistics of the cast iron pan and the sheet steel pan are as follows: Average life of locomotive, 15 years; sheet steel pan must be renewed every two years at a cost of $243.75; average upkeep of sheet steel pan, at engine houses, $186.00; average cost of sheet steel pans at shop, $246.15; total cost of renewals and repairs to sheet steel pan during the life of a locomotive, $915.90; total cost of cast steel pan, $214.00; material and application will last 15 years, or the average life of a locomotive; cost of sheet steel pan, 15 years' service, $1,915.90; cost of cast steel pan, 15 years' service, $214.00; saving of locomotive, 15 years' service, in favor of steel pan, $701.90. The saving in fire damage along the right of way should also be considered. The steel ash pan has been adopted by the Public Service Commission and the Conservation Commission of the State of New York. I have followed up those in service since they were applied, and have never seen anything the matter with them. The dampers are on an incline, which has a tendency to keep them closed. I know of no state more careful along the right of way in the woods than New York State.

Mr. Powers: If water is used in the pan how is it applied? Sprinkling system?

Mr. Bennett: In the fire zone of the Adirondacks the Conservation Commission during the summer season requires overflow pipes from the injectors.

Mr. Stucki: The trouble with our ash pan is that we allow too much under draft and the pans burn out. Most any kind of an ash pan would be suitable if properly applied and attended to.

Mr. Nelson: Many miles of the Missouri Pacific track run through the wheat belt. During the war period an inspector was sent out to examine front ends and ash pans and the saving of damage to crops over previous years was remarkable. If front ends and ash pans are cared for and round house men do their duty, much fire damage can be prevented. We have the master mechanic front end. It is as good as any other. Our ash pans are hopperless. We have 900 in service. If properly constructed they can be applied to all classes of engines. There is no casting or cast iron slide, only one opening in the bottom, and only four seams. There is absolutely no chance of draft underneath. Some have been in service three or four years and are in first-class shape. They can be cleaned by gravity. We have a flushing arrangement whereby cold water is obtained from a branch pipe. If we can get away from the Hopper plan, much danger from fire would be obviated and a saving of fuel effected.

MR. NIMMO: Have any large clinkers removed from that pan?

MR. NELSON: On the Mikado class of engine, which has a trailer, it is necessary to reverse the scoop, running it to the back instead of the front, a double scoop being formed. On our engines we have a brace arched and welded to each side of the frame. It is possible to put a larger clinker through the pan than through the dump, as there are more openings.

MR. NIMMO: We could not succeed with the pan on account of clinker.

MR. NELSON: Did you make that provision?

MR. NIMMO: I cannot say.

On motion of Mr. T. F. Powers the report was accepted and the discussion closed.

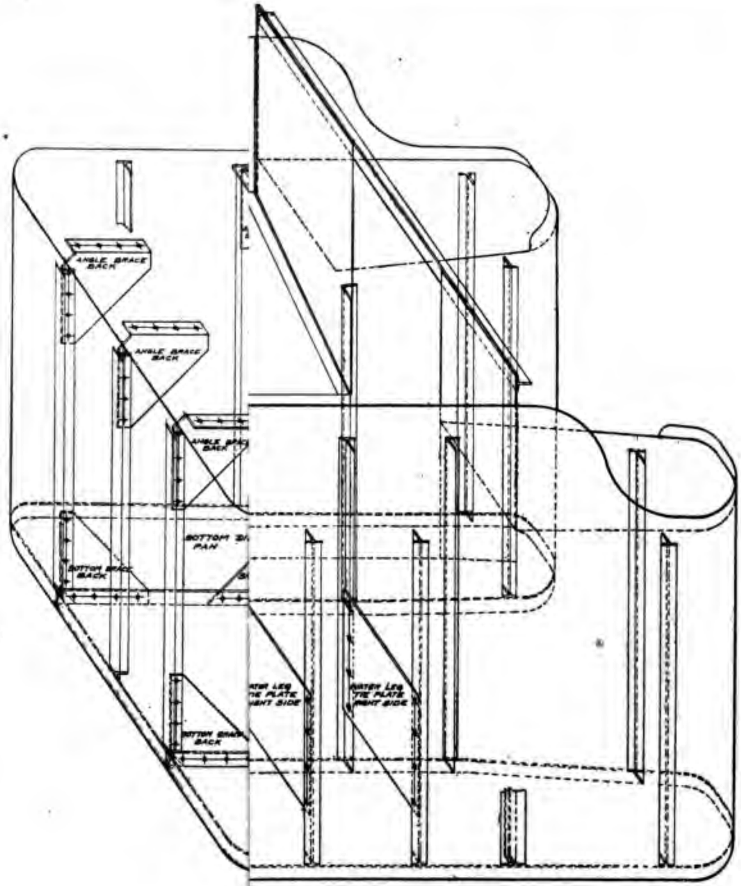
THE PRESIDENT: The next subject on the program is the "Best Method of Bracing Locomotive Tenders," Thomas Lewis, Chairman.

REPORT OF COMMITTEE ON

"The Best Method of Bracing Locomotive Tenders."

The members of the committee on the above subject being widely located in different sections of the country and only able to communicate by mail, also the limited time we have had to prepare our report has interfered somewhat in giving the convention as full report as the subject deserves.

However, speaking from past experience the best method we know of to Brace Locomotive Rectangular Tanks is what is known as the tee bar and plate method.



TANK BRACING.

The object of bracing locomotive tenders is to make them strong to stand the strains and stresses that take place when engine is in motion rounding curves, sudden stops, constant jerking, water surging back and forth. To prevent sides and back of tank from bulging outward. To do this we apply braces on the interior of the tank, we improve on our anchor lugs so as to stop tank from moving on tender frame.

What then is the best method of doing this work? Our opinion is the application of tee bars 3 x 3 x ⅜ inches on sides and back spaced about 24 inches apart in a vertical position, length of bars to be equal to the height of tank from bottom to top. These bars to be rivetted with not less than ⅝ inch diameter rivets spaced about six inches apart, zigzag.

The top of tank at the rear end is braced by the application of tee bars rivetted to the under side with gussett plates rivetted on ends. Slope sheet in coal space is braced by the application of two tee bars rivetted to the under side, also supported by stay plates placed vertically and rivetted to slope sheet and tank bottom reinforced by angle bars. Dasher or splash plates of ¼ inch or $\frac{5}{16}$ inch thickness are used for the purpose of frustrating the rush of water in the tank; they also form a brace for top and bottom of tank. One plate is placed in center between coal slope sheet and back of tank. Two plates are placed on each side, these are rivetted to top and bottom of tank. Center dasher plate is flanged on sides and rivetted to top of tank, also gussett plates are applied at bottom and rivetted, which gives dasher plate added strength. We believe in order to make a permanent job all braces should be rivetted and not bolted, size of rivets to be according to thickness of braces used.

This method of bracing is recommended for all rectangular tanks made from steel plates of $\frac{5}{16}$ inch thickness or less, because in our opinion we get better service than is given by the old method of applying the longitudinal angle iron bars with cross stays. Also it has the tendency to eliminate leaky rivets in anchor lugs. We are of the opinion that when *weight* is not taken in account when designing locomotive tenders that if the tanks were made from heavier material, say steel sheets of ⅜ inch thick, it would greatly simplify the matter of bracing as heavier material could be used which no doubt would be more satisfactory. However, with ¼ inch plates for tank sides and top, and $\frac{5}{16}$ inch thickness of plates for bottom of tank we offer the best method of bracing that we know of at the present time, as it not only braces the tank in all its principal parts, and still leaves plenty of space on the interior so that inspector can move around easily to make his inspection or repairs when necessary.

THOMAS LEWIS, Chairman

E. J. SWEENEY J. P. MALLEY
J. J. ORR J. T. JOHNSON

DISCUSSION.

Mr. Lewis: No doubt the report on the bracing of tenders or tanks as presented in our report will be new. to many members, but this has been our practice for probably four or five years. When we began changing the bracing of our tanks, one of the most radical changes, one of the best changes in my opinion, was in placing the bars in a vertical instead of the longitudinal position. Our report is presented with the will and the hope that it will be of some benefit. We are here to learn which is the best method of doing our work in connection with the locomotive and tender. Thank you. (Applause.)

Mr. C. R. Bennett: It has not been my good fortune to be called upon to build any of the large standard locomotive tanks of 8,000 gallons water capacity. We are using tanks of this size which were designed and manufactured by experts and I have no criticisms to make so far as their design is concerned. The bottoms of the tenders to which I have reference consist of two sheets ½-inch thick; all other sheets except the bottom sheets, are ¼-inch thick. The angle steel is 3x3 inches and the rivets are 11-16 inches. We have about 100 of these tenders. They give trouble on account of cracking, where the gusset plates are fastened to the side sheets for proper bracing of the side sheets of the tender. If these weak zones were reinforced by an additional plate this trouble would be overcome.

Mr. Barnes: The gentleman remarked that by applying a patch the trouble would be overcome. I have noticed in many cases that the cisterns on the tenders while the engine was in motion would vibrate at the sides like a frog coming out of the water. Engines having what we term the water table will also vibrate up and down. If these conditions are allowed very long the tanks will develop cracks above the angle irons. By applying the patch the trouble has not been removed, but only remedied temporarily.

Proper bracing of tanks will very materially overcome the trouble from cracked cisterns.

Braces should be fitted up, the holes being made to correspond, and then riveted solidly to the angle or Tee bars. When the engine is in service vibration of the water will not loosen the braces.

Broad plates are subjected to much strain. Unless applied in a substantial manner they will soon become loose and collapse and wear holes in the bottom of the tanks if allowed to remain on bottom very long. The usual method of bolting the braces in tanks with the ordinary rough bolts has proven unsatisfactory. The bolts soon become loose and the vibration of the braces soon wears them off, or the holes in the braces are enlarged and the braces and break waters collapse. The tanks soon crack from the vibrations to which they are subjected unless properly braced.

Mr. Elkin: Our method of bracing tanks is to run a longitudinal splash sheet the entire length of the center of the tank. This sheet is attached to the top of the tank by a 3½x3½ inch tee and has 1 3x3 inch angle iron on the bottom and one in the center of sheet which are fastened to tees back of the coal space. This sheet is placed 5 inches from the bottom of the tank and is braced with 1-inch round braces which have a jaw riveted to the tee iron on the sides of the tank. These braces run through the splash sheet with a nut on each side of the sheet. The sheets are made of ¼-inch steel and riveted in with ½-inch rivets. This is the most successful way in which I have ever seen a tank braced. We have some running now that have been in for 10 years and are in good condition.

Mr. Stucki: I have served my time on tanks and know vibrations wear out the braces. If properly built vibrating would be unnecessary. The correct construction of a tank is a more important subject than bracing. No such tank is now in service.

The President: We have many new members. Give them a chance to take part in the discussion instead of two or three men doing all the talking and which is not beneficial to all. I will not, hereafter, give the floor to any man who has spoken once on a subject, until after all who wish to speak have had a chance to do so. So far it has been too much of a one-man proposition for the good of the association.

Mr. Madden: The cracking of tank sheets at the end of the tee or angle irons is due to the sharp edge left on the bars by the cutting-off shears. If slightly turned back after the bar comes from the shears it would eliminate a great deal of the trouble now known.

Mr. M. E. Monigle: At the terminal with which I am connected are many switch engines. We had much trouble with the tanks cracking along the sides. The angle irons are in a vertical position, and crack at the bottom iron. Patching the cracks does no good. Five months ago we replaced the jaw brace and connected with the turn buckle since which time we had no trouble.

Mr. Whitfield: There is always a sag in the brace. With a good turn buckle, and these sides held in, and the brace put up and down the phlange in the side and on the top, cross braces would not be needed. It would also serve as a splash board and stop vibration of the water.

Mr. Crites: Right after the Civil War, the Pennsylvania Railroad had a "Green Back" engine in which the angle iron had been put. We seldom had a crack.

Mr. Charles Duffy: W. E. New, master mechanic of the Kansas City Terminal, designed a tank without an angle iron. It consists of

48 inch sheets, wrapped around the tank, and a three-inch T iron with the T on the outside of the tank. The bracing is partitioned 48 inches square across the tank and riveted in. In the center is a passageway, through which you can walk from one end of the tank to the other. The back end is a phlange riveted to the sides. The front end is a slope, wedged shaped, with an independent coal hopper. The hopper will feed the last scoop of coal down to the gates. Water capacity of the tank is 8,000 gallons. It has been in service 12 months and still rigid.

Mr. Powers, of the Rock Island: Some years ago on the old B. C. R. & N. Railway, now a part of the Rock Island, two 5,000 gallon tanks were designed by Mr. H. J. Raps. They were braceless. It was made of tee irons and given an offset, in both top and bottom angle irons. Those tanks are running today, 18 years afterward, and not a crack in them. Mr. Raps also put in splasher plates. He had a tee iron up and down, and then a reinforcing plate on the inside and riveted. The bottom and top of the tank have never cracked. We have removed the bottom on account of thinness. Mr. Raps put in a cage made of netting, so that no hay or offal could get in the tank, and it is one of the best tanks I ever saw. While it was only 5,000 gallons capacity, I think today it can be duplicated with stronger angle irons.

Mr. E. J. Sweeney: About 90 per cent of our tanks are built according to the Tee iron and plate system. The majority of our work is in the switching service. The vertical T irons are off-set to fit on the top and bottom angle iron. We do not have any trouble with the plates cracking or the tee irons breaking. We have tanks that have been in service 10 years, and are practically as good as the day they started. We have never been troubled with cracking of the sheets or tee iron on those tanks. We reinforce all our anchor lugs on the inside of the tank. The reinforcement plate is offset and riveted to the bottom of the angle iron.

On motion the discussion was closed.

The President: We will now take up the report of the committee on oxyacetylene and electric welding, Mr. H. J. Wandberg, chairman.

REPORT OF COMMITTEE ON

"Acetylene and Electric Welding"

As Chairman of this topic, I took the matter up with the other members of the committee, L. M. Stewart, J. J. Davey, John Harthill, P. F. Gallagher and T. F. Powers, and wish to state that the committee in presenting this paper realized the fact that this topic has been before the convention for several years and has been thoroughly threshed out by the members. We find it at this time very difficult to write up any new facts on this subject. However, we believe the following information will be beneficial to members who have recently installed, and those who are now using oxy-acetylene in their shops and should be beneficial to all new members.

APPARATUS.

Much has been said as to the different methods of acetylene welding. Many of the shops a few years back were equipped with the Portable Generator, using what we term "High Pressure." Later, new apparatus was installed and shops were piped throughout for the acetylene and oxygen, using low pressure, which at this time is in pretty general use throughout the United States. There are a number of shops that still use the oxygen and acetylene gas furnished in holders with the oxygen holders containing 1,800 to 2,000 pounds, and the acetylene holders from 200 to 250 pounds pressure. Where this method is used it is necessary to have the different regulators for the oxygen as well as the gas; this outfit for each welder. But where the "Low Pressure" system is used, it is only necessary to have the regulators where the gas is generated and the oxygen manifolded, and it is the opinion of your committee that the "Low Pressure" system piped throughout the different departments, both oxygen and acetylene, will give the best results.

WELDING TORCHES.

There are several different makes of welding torches on the market today, and while they will all do good work with an experienced operator, we believe there is some difference and some torches work out better than the others; that is, they are more quickly regulated and do not back-fire as readily as some other makes. In most all cases the welding tips are made up of copper and give much better results than the brass.

CUTTING TORCHES.

Many different styles of cutting torches are on the market, and while they all do good work, some seem to do better than others. Some will back-fire readily, where with others it is almost impossible to make them back-fire, and in some cases both with the welding and cutting torches where they do back-fire, they can be ignited quickly from the heated iron without re-adjusting; where, with other makes, it is necessary to shut off and start all over. This causes a loss of time as well as a waste of material.

I do not feel that it is necessary at this time to go into details in regard to the method of preparing and welding up the different jobs, such as cutting out and preparing new sheets for welding and many other jobs we find to do, due to the fact that the papers furnished herewith by the committee explain this fully and undoubtedly will be printed in full and furnished in our Proceedings.

I might add that many of the different shops have different methods and are seemingly getting good results. As to our practice at this time on the Chicago, Milwaukee & St. Paul Railway I might say to start with, we are and have been welding in all our side sheets, bolting up securely, applying stay bolts and rivets before welding. We are also welding all our cross-seams by removing rivets, scarfing down, and welding up all holes and are not removing any stay bolts, getting first-class results; welding in all our door collars, inside and out; three-quarter door sheets, one-half flue sheets, top or bottom; full flue sheets; front sections of crown sheet; welding in bottom patches of front flue sheet, 12 inches to 20 inches high; cutting off all our stay bolts and radial stays with the torch; in fact, doing everything in the line of welding we may find to do, and I can say that the sheets we are welding up are standing up good and giving us no trouble. The only trouble we do have at times is welding in patches in old side sheets, or where side sheets go to pieces rapidly due to poor water conditions. Where engines are in bad water territory, sheets do bulge between the bolts and at times the weld is pulled in two.

I might add that in visiting the different railroad shops, I find that of the firebox work, such as applying fireboxes, side sheets and door sheets, the welding in most cases is being done with the acetylene torch. Shops visited had both the acetylene and electric welding outfits, but were using the electric outfit mostly for welding flues, mud ring corners and roundhouse work, where I believe the portable electric welding outfit will give good results.

At this time we have just installed the electric welding outfits and figure on welding in all flues, mud ring corners, side sheets, cutting out the center and welding in new without removing mud ring rivets. Also figure on doing considerable firebox and boiler work with the electric welder, where flanges on front or back flue sheet are still good, cutting out the center and welding in new.

Mr. Stewart, a member of the committee, has received the consent of the Executive Board to incur an expense for slides showing the various operations in connection with this report, and believe arrangements will be made whereby these slides can be shown at our coming convention, and each slide passed on as to the methods used at that time. This will give all members of the Association an opportunity to see just how the work is prepared and completed; in fact, shows what can be done in the line of boiler work with the oxy-acetylene welding outfit.

HENRY J. WANDBERG, Chairman.
L. M. STEWART,
J. J. DAVEY,
JOHN HARTHILL,
P. F. GALLAGHER,
T. F. POWERS.

Committee.

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DISCUSSION.

Mr. Wandberg: What we want to get at is the best method of handling this work. Acetylene welding has been in operation for many years; so has the electric, but not as much so with me as the acetylene. While we are getting good results from the acetylene, we have considerable yet to learn. As to the method of preparation for welding—some men prefer loose sheets. For a number of years, if time permits, we have put in all the stay bolts during the riveting and the welding lasted with good results. If we are not prepared the men put in the stay bolts and rivets. We weld them in, as we see no difference so far as the result of the work is concerned. Some two months ago we installed an electric welding machine, and are doing fairly well though not getting at the present time what we expected. The welding is only an experiment. Failure or success of the weld is due absolutely to the operator and the material furnished. We can make just as good an electric as we can an acetylene weld, but it takes experienced men to do it. We had more or less failure with our acetylene welds when we first started. I have not had much experience with the electric. There is plenty of room for improvement, the field is large and none of us know too much about it. We are here for the purpose of getting not one man's mind or experience but to benefit by everybody's experience.

Mr. Lewis: In 1915, when we had a convention in this room, I showed a model of a firebox welded throughout—a firebox without rivets. Up to that time I believe I was the first man who had the nerve to weld a firebox. My confidence in the method of doing that work has never been shaken. I do not mean to say that we have had no failures. I believe what has just been said—that if we have failures on account of oxyacetylene or electric welding, it is due to the operator, or to some of the material or the torch used. We cannot do our work without the acetyene welding machine and we might say also the electric welding machine. On our road we have today about 150 locomotives with welded fire boxes. Some are large fire boxes with 48 inch combustion chambers. Some are smaller. We now have a separate department for welding with a foreman who gives his whole time to it. It has been a great success.

Mr. Lucas: What method are you using in the firebox sheet, Mr. Lewis, gas or electric?

Mr. Lewis: Both.

Mr. Lucas: Which do you use for welding firebox sheets?

Mr. Lewis: In our shops we use gas. We have not welded any fireboxes by the electric method in our own shops, but we have new locomotives built at the Baldwin Locomotive Works, the fireboxes of which were welded by electricity.

Mr. G. W. Bennett: I have a photograph showing a low water case from which the fire box wrapper sheet stripped away from about 800 bolts. It is an autogenous welded fire box and the back sheet gave way from mud ring to mud ring, causing the death of three people. The water was down about 4½ inches below the top of the crown sheet. About three months prior to this accident they had a low water case on the same boiler with a riveted fire box. The water was down about the same distance below the crown sheet. At that time it pulled out 78 bolts. Three persons were slightly injured. The boiler remained on the frame. With the welded fire box, three persons were killed, the boiler was torn off the frame and thrown ahead of the locomotive 200 or 300 feet. It is reasonable to assume that this accident was intensified by the welded fire box.

A Member: How do you know that?

Mr. Bennett: Circumstances proved it, because the water was down in both cases about the same distance.

A Member: Did the sheets separate where they were welded?

Mr. Bennett: Right through the weld all the way around the back head.

What was the steam pressure in both cases?

Mr. Bennett: It was the same boiler. I believe it carried 200 pounds of pressure.

What were the working conditions in both cases?

Mr. Bennett: About the same.

How much pressure did the boiler have when she let go? (Laughter and applause.)

Mr. Bennett: It would be impossible to say, the engineer and firemen being killed.

Did that sheet fail on the welded joint?

Mr. Bennett: All the way around, absolutely. We have six photos here to show it. Here is another case. The running seams on a firebox crown sheet were welded; the water was down about 4⅞ inches. It did not pull a bolt out of the crown sheet, but the running seam gave way the entire length of the firebox and three were killed in that accident.

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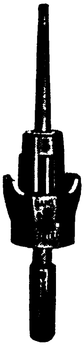
Fig. 36
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Fig. 285
Ideal Sectional Expander.

Fig. 40
Ideal S. F. Roller Expander for power or hand use.

FIG.376
Ideal Self-feed Tube Cutter for hand use only

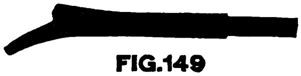
FIG.149
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MR. BENNETT: Yes, electric. Then we have another case, also electric. The running seam in this fire box was evidently leaking. The sheet was cut through the rivet holes, pulled together and the holes welded up. Three were killed in that accident. It gave out at the seam. The enlarged view of the electric weld shows the weld was not properly made; in some places only about a 32nd or a 64th of an inch, just like soldering a tin can. It is the extreme uncertainty of not knowing what you have. These cases prove that where autogenous welding is done, where the water is liable to get down as low as the weld, it intensifies the accident. In another case a super-heated tube had decreased in thickness or deteriorated to such an extent that it was down to about a 32nd of an inch in thickness, and they tried to weld that up. It gave way and caused and accident.

MR. LEWIS: Was the primary cause of the accident in each of these cases low water?

MR. BENNETT: Yes, sir.

MR. LEWIS: In your long experience as a boiler maker and inspector did you ever have any boiler explosions, when fire boxes, side seams and flue sheets were riveted? Where did the rupture take place? Was it along the riveted seams and other parts of the boiler?

MR. BENNETT: Sometimes it would give way at the riveted seams and sometimes tear through solid metal, but I never saw a case in a riveted firebox, where the water was down 4½ inches that the sheets separated all around the back head.

MR. C. R. BENNETT: When a seam is acetylene welded, you take it for granted that it is good, but have no way to tell; therefore if you take two sheets and punch the holes in it at the proper distance, and put rivets in, after it has been tested, the efficiency is determined. Mr. Bennett says after being electrically welded, no one can say what the efficiency is. If it had been riveted the steel would have stayed together and torn the sheets.

A MEMBER: A new box would cause a more terrific explosion than an old box, because it holds pressure longer, and when it gives way, it does so all at once. When a tight drum explodes it will cause a terrific explosion.

MR. CLARK: In your investigation did you not find defects in the welding?

MR. BENNETT: Yes, we have pictures here to show them.

Mr. **Whalen**: Anything can be welded on a locomotive with acetylene, if it is properly done. It depends on the operator, but we all know that no chain is any stronger than its weakest link. I do not think from what has been said, that the firebox that was electric-welded and had the low water, is a proper criterion for condemning electric welding. In our shops we get the best results from electric welding in certain localities of the firebox. But we know that this engine had low water; and we know that if through the low water accident, it stripped the heads off the staybolts, and the radio stays, then the sheet was no stronger than it was at its weakest point; consequently the electric welded point was the weakest of the sheet, and we know not more than 85 per cent. efficiency can be obtained from any welding. I do not see why we should argue or try to condemn electric welding, because the man who made that electric weld may not have been a proficient welder. I know that in an acetylene proposition you just begin to creep in about six months, and learn how to do things. I visited the Springfield shops of the Frisco. They asked "how long have your men been welding frames?" I said, "About three months." "They are welding engine frames?" "Yes." "What results are you having?" "They break in about two or three trips." We had been welding only two or three months. The foreman of the welders in the Springfield shop pointing to a man, said: "He has done nothing but hold the torch for the last six months, and I would not put him on a frame now." Efficient welding can be done with electric and with the acetylene.

Mr. Austin: In the last month, I have seen a crown sheet with an electric welded seam running across the forward part that had bulged downward seven inches on account of low water. A close examination and inspection of the welded seam failed to disclose the slightest evidence of fracture or weakness. It apparently was just as good as the solid metal. I have examined and investigated many firebox explosions. The extent of the explosion or why the firebox plates ripped this or that way is purely conjectural. The rupture is likely at any point near the hot spot and will extend in any direction. It is sometimes as difficult to explain why the box is not blown out as it is at other times to explain why it was blown out. When these accidents occur the solid sheet is as apt to rip as a welded sheet—it is just as apt to rip as a riveted seam.

Mr. Service: Tell us, please, Mr. Bennett, where the seams were located.

Mr. Bennett: At the flange of the back head.

Mr. Service: At what distance?

Mr. Bennett: About 2½ inches. The photograph will show.

MR. NELSON: It is simply a question of the operator and material. The accident which Mr. Bennett has referred to would undoubtedly have happened whether acetylene or electric welding had been done. Authorities tell us that 90 per cent. is the best that can be had on a weld. That is much higher on a riveted seam—2 inches pital, ¾-inch rivets. When low water was in question on the engine, there was doubtless excessive interior pressure. The sheet was bound to go. If the weld was 90 per cent., the plate was 100 per cent. It is natural to assume that the weld would fail, as it would go in the direction of least resistance. Our road has had electric and acetylene for the last four or five years. We do about 60 per cent. of our firebox welding with the electric, and 40 per cent. with the acetylene. It depends on the condition of the welder. With acetyelne we put in all the staybolts, and burn them off. We do not apply the staybolts with the electric. We have been welding flues for the past four years, on all classes of power. We tried the Hodges system on one engine using the old system of finishing the flues and then welding them. Our shops are progressive with both processes, and still confine themselves to stay surface. It is not a question of the process, but of encouraging the operator so that every man will be a good welder; then we will not have so many failures. Failures don't mean condemnation of the process. As a rule the responsibility is with the operator.

MR. E. W. YOUNG: Mr. Bennet was trying to bring out that a welded joint, when put into the bending stress, is not equal to a riveted joint in strength.

MR. BENNETT: Not the bending stress, but the service test.

MR. YOUNG: My understanding is that when a welded joint was put in a straight pull, the tests have been very successful.

A MEMBER: What weldings are you speaking about?

MR. YOUNG: Either one, acetylene, or electric. I wish to remind you of what was said by Mr. Aishton this morning, "we will get some good out of these meetings if we do not always agree with the other fellow." The discussion has developed that a few are challenging the other fellow. If you fellows want a fight, we will sign you up, and put the Dempsey-Willard fight out of sight. (Laughter.) We want to get your opinion, but for God's sake don't throw a challenge at the other fellow, as though he were lying. Taking a punch at one another is not what you are here for. Every man has a right to his opinion. We want to bring it out, and get all the good points. I hope from now on we will stop fighting, and bring out all the good points regardless of what the other fellow says. Mr. Aishton said, "We are to get some good out of it, even if we do not agree with the other fellow." (Applause.)

Mr. Harthill: You cannot make a welder in three weeks. We know people are advertising they will make a welder in six weeks and get the man a job. Probably that is the kind that causes explosions. An A-1 welder is not made in three weeks, or six months. I have such welders at my shop and they have been working at it since 1910. In an explosion we had the side sheet ripped out from the first row of button-head crown bolts down to the mud ring—straight across the mud ring up the flue shoot, and broke it open at the side. The welded sheet was slipped three-quarters of an inch; the solid sheet, all the way through and more than 300 bolts pulled out of the sheet. Not a broken bolt was found. It showed we had an efficient welder. No man should be allowed to weld on a firebox unless he can weld a test piece that you can send to your laboratory and get a 75 per cent. weld out of it. The acetylene apparatus is perfect; results depend on the way it is handled. The metal must be A-1. Don't use any material that can be found around the shop for welding seams. Good results will not follow. The best apparatus must be bought and put in the hands of a good operator. Then as high as 95 per cent. can be had with an increase of the weld of 12 per cent. No blacksmith or forger will claim he can make a weld of more than 80 per cent. under the steam hammer, unless allowed to reinforce it. Every weld should be reinforced from 12 to 18 per cent. It will give 75 per cent. efficiency. The new art of boiler making, is to be the finest we have. You have to be on the job yourself, and know that your welder is using the right quality of gas, that it is mixed right, and he is putting in the metal. If that is done we will not have these explosions. I have welded something like 1,400 sheets in fireboxes since 1910, with only one explosion, which showed that the weld was A-1. I believe our welders do as good work as can be done by man power. None of us are perfect; we are not infallible, but we must be on the job, and see that the men are not slighting the work. Electric welding for fireboxes is not as good as acetylene. I cannot get as high efficiency out of a test piece of the electric welding as I can with the acetylene; but when it comes to welding a flue, it is necessary to consider conditions. On the New York Central, for instance, we weld flues and get better results, with a reduction of labor in round houses. When people fail in this respect I find that two-thirds of the trouble is with the operator, and I keep tab on them.

Mr. Clark: If a man who has not been instructed is allowed to plaster up a lot of dope, the sheet comes down in the weakest place. If a welder is properly educated he will do proper work.

Mr. Powers: We have been in the welding game on the Northwestern for many years but could not successfully weld flues. We have all kinds of water, and we can not make electric welded flues hold in bad water. I believe that the New York Central, before welding flues had an arbitrary rule requiring expansion of two-inch flues every 30 days, whether they needed it or not. Now they tell us that by not doing it a big reduction in round house forces has been made. If they had not previously expanded flues every 30 days, the reduction would have been made at that time. We have welded our own engines with our own operators, as well as those from locomotive works, and I have taken out the back flue sheets with cracked bridges inside of seven and eight months. We have had engines come to our shops from foreign railroads on which it was asserted two-inch flues had been used successfully, but the record showed that they were seven, eight and nine months old, with 70 cracked bridges.

Mr. G. W. Bennett: When welding your flues is water put in the boiler?

Mr. Powers: We have tried it both ways.

Mr. H. W. Maguire: We have been using electric welding for about two or three years to weld patches and flues and have had good results.

Mr. Wandberg: We would like to know how many and what percentage of failures have been had with acetylene and electric welding, and what is done when the welds open? Welds will fail more or less. What shall we do to remedy that? Suppose an engine turned out today ran a month when the weld opened 10 to 14 inches, what are we to do? We have failures where there is no low water. Mr. Powers said welding cracks the bridges and they cannot run them. The New York Central welds everything and has no cracked bridges. It suggests the need of investigation.

A Member: Did you ever have a side sheet cracked vertically that was not welded?

Mr. Wandberg: Sure.

A Member: You take care of it by patching?

Mr. Wandberg: I do. When I spoke of failures I referred chiefly to sheets or fireboxes that had been welded.

Mr. Yochem: I wish to know what preparations are made with the sheets before they are welded with electric or acetylene? Is an offset roll or corrugation or something of that nature applied to take care of expansion and contraction? How are patches applied? Are they boxed, dished or corrugated to take care of the expansion and contraction?

My practice with the acetylene, when applying patches to flat surfaces in the firebox is to make provision for expansion and contraction by boxing patches. After the job is completed or at any future time a defect in the weld appears, it can be easily rewelded.

Mr. Harthill: We have an engine that was making 50,000 to 60,000 miles over a 304-mile division. We welded its flues with oxy-acetylene. We increased the life of the flues from 10 to 12 months to 18 and 20 months, and have to take them out now owing to pitting by the water. We increased the mileage to 125,000 miles. We have just renewed an engine of the Pacific type at Gunnison, Texas. The flues were put in, October 1917. We applied a new set of flues April 1, with an old flue sheet, welding them again to the old sheet, and have not had a failure or a cracked sheet. We do not weld super-heater and not the small flues. We have never had any cracked bridges. We countersink the sheet all the way through, leaving it larger on each side and begin welding at the back, welding right through. This is preferable to counterboring the sheet and welding half way through.

Mr. Powers: I was talking about the welding of two-inch flues.

Mr. Clark: All of our flues are electrically welded. Previously we had an average of one engine failure every day, owing to leaky flues. Now we seldom have a leaky tube and have no engine failures.

The President: Let us now have the slides.

Mr. Stewart: These slides were made in 1916. Your committee thought we would present them now for the benefit of members that are going into welding. All the views shown are of the oxy-acetylene process; no electric views whatever are shown, because, in my shop, I use electric welding only for flues, building up, etc. (Mr. Stewart then showed the views, and read a paper in connection therewith.)

While the views were being shown, the following questions were asked by various members, and answered by Mr. Stewart:

Q. Is any provision made for expansion and cracking? A. No, sir. We often drive the bolts, if the welders are busy, except the row next to the weld.

Q. Do you weld straight through your sheets, or spot-weld. A. We start about the center, and use steel wedges.

Q. You weld straight after you begin? A. Yes, sir.

Q. Do you have any trouble holding your sheets? A. No, sir.

Q. What opening do you give it? A. Eight to three-sixteenths of an inch.

Q. Does cutting off those bolts with acetylene loosen them? A. No, sir.

Q. What is the idea of putting stay bolts in before you weld the seam? A. What is the idea in leaving them out?

Q. The bolts hold your sheets rigid, don't they? A. No, I always put my bolts in.

Q. Isn't it bad practice putting in the bolts where you are welding? A. I do not find it so.

Q. On a straight fire box, would you put the bolts in? A. I put them in most always. Sometimes the welders can't get to the job, and I don't have time to stay bolt them. I put in the row of bolts, and the bolts must be put in to hold the sheets. Those bolts are driven, and are ready to burn off. You will note that the welding is not done.

Q. Was that engine under your supervision after it was in service? A. Yes, sir.

Q. Did it go to another division? A. That engine runs into Waycross terminals, and I have never heard any complaint. It is one of many we did that way?

Q. What is the idea of cutting down that door sheet? A. What do we want to do? Let us get into that other lap? It would be bad practice.

Q. Do you have any trouble with your flat welds breaking? A. Occasionally we get a failure; it has always proven a defective weld.

Q. What is the object of leaving the mud rings until the last thing. A. We find that the better practice is to drive the mud ring rivets afterwards. Some shops do not do that. It may be more of a habit. I have never tried to drive my mud ring rivets before I weld them.

Q. You don't take care of any expansion and contraction? A. No, sir.

Q. Those stay bolts look as though they had been very badly played with. Did they shoot them out at random? A. This is a very bad picture; it does not show up well.

Q. I speak of the oblong shape of the hole. A. The way the metal shows it, the hole is oblong; I think it is due to the way the metal was put on. We round it up when we weld it up, and re-tap it.

Q. Do I understand that that sheet is complete? A. It is welded to that point.

Q. If you had an inner weld at that joint to add strength to the front row of cylinder bolts would you weld it just the same? Some roads use an inner weld six inches by an inch and a quarter thick for the benefit of the cylinder bolt? A. Sure. Often when cylinders are removed it is found that sheets underneath are gone, and new sheets are put on.

Q. Some roads have sheets that run inside the smoke box; you could weld that just the same? A. Yes, from the outside.

Q. Do you weld through the thick or thin part of the bridge. A. The bridge is of uniform thickness; the bridge, of course, is beveled.

Q. Do you weld lengthwise or crosswise with the bridge. A. The bridges are the same—only one side is welded.

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Q. Is any provision made for expansion on the flat surface under the door hole? A. No, sir. It is heated and welded up around the door hole.

Q. Do you put any corrugation in a patch? A. No, we don't corrugate anything.

Q. Do you put in any bolts and return the engine to service when there are cracks? Where do you take care of your expansion and contraction. A. Why should it crack? If that is defective, bring it down to the mud ring at the time you repair; don't put in that kind of a collar.

Q. What is the percentage of failure on that class of work? A. Occasionally we have failures of two or three inches, but when trouble is found it is due to a defective weld. It never cracks through the center; never will pull loose from one side to the other; when found that way, it was not welded.

Q. Do you weld with electric or gas when making repairs? A. Gas.

Q. Ever tried electric? A. No, sir. Electric welded flues is the only experience I have had in electric welded fireboxes.

Q. Do you have any trouble with vertical welds underneath the firebox? A. Sometimes, from a defective weld. We seldom have a crack through the center of the weld. It pulls loose on the side, and if found that way, it was not properly welded.

Q. What is the difference in the cost? A. You mean in a collar like the one shown and putting in a three-quarter sheet?

Q. Where do you save? A. Considerable welding is saved, only a few rivets and stay bolts being necessary.

Q. What provision do you make for expansion and contraction below the door? A. None. All the sheets in all classes of the welding in a firebox are fitted up straight, never corrugated or rolled or anything like that.

Q. You put all of them in flat? A. Yes, sir.

Q. Your welders are worth $100 a day? A. Well, I have three for whom I would not take that much, and one I would not part with for $1,000.

Q How much steam pressure do you carry on that kind of a boiler? A. These are small fellows—160 pounds.

Q. Did that job prove successful? A. Yes, sir.

Q. You had no trouble from cracking? A. No, sir. When I first went into the business I never riveted a flange on welded side sheets.

Q. Do you mean to tell me that those bolts won't loosen? A. That's a four-inch space; you are two inches away from it. Our experience taught us from watching the welds a couple of years later that these bolts would begin leaking, and we would get some cracks.

Q. Have you personal knowledge that that longitudinal welded seam has given two or more years' service, without showing any defects? A. Yes, sir.

Q. Before it showed any leaks at all, or any defects? A. I speak from personal knowledge.

Q. I mean from the effects of the sulphur and the gases in the fireboxes. A. Two years' time on these little fireboxes, but when defects showed we knew where we made our mistake. The cracks would come from the weld up to that stay bolt.

Q. I mean did your weld show any failures in that time? A. Yes, sir.

Q. What were those failures? A. Sometimes we get a little failure and, as I have said, when you thrash it out, it is a defect in the weld, but we have numbers and numbers of sheets that are over five years old.

Q. I speak exclusively of that longitudinal weld? A. We have them four years old.

Q. I have tried that with what I believe to be an efficient welder, and to save my soul, I cannot get one year's service out of it, before it becomes porous, and spongy, and begins leaking and goes bad. A. Through your weld?

Q. Yes; that is in sections of six inches, and may be six at the other end, or may be a foot, as much as you will let it go. A. The places you describe are defective.

Q. I attribute the cause to their being so low in the fire. I have been unsuccessful in making a weld of that kind that will stand from year to year, absolutely, using the best of Norway iron as a solder, with a welder who has had 10 years' experience, good or bad. I don't put the staybolts in. I do drop the sheet in order to provide for expansion. Still the weld will not give me satisfaction. I do not know how to account for it. I merely refer you to that on account of its shallowness. A. It is bad practice.

Q. I was merely asking you the service rendered by that weld. A. We have some out of which we get two years, but we did not do so many like that, and only on the low pressure engine with a deep firebox.

Q. I never could get better than 8 to 12 months out of them.

Mr. Patrick: I move a vote of thanks to Mr. Stewart for his painstaking efforts.

The motion was seconded by Mr. Brown, and carried by a rising vote.

Mr. Brown: This is a most important question. We are represeinting here and reporting to our superiors, the U. S. Government. We are going on record. Enthusiasm prevails absolutely; be guarded lest we fall! We are welding in the Louisville & Nashville shops, in South Louisville. Although progressive, I am not offering anything as an alternative for acetylene and electric welding. The latter, I do not know anything about, but the former, I do. If we have any recommendations to make, they should be 100 per cent. Every member who has spoken has shown that there is a weakness in both methods of welding. Uncle Sam will not accept that weakness. One of the government inspectors has produced evidence in a photograph that a weakness did occur and cost three men their lives.

How are we to explain that to Uncle Sam? He wants you to be as near 100 per cent. perfect as you can. He insists on it in regard to braces. He says you must have an efficiency of 9,000 pounds on every longitudinal brace. You are not going below that. He says you must have 55,000 tensile strength in a flange. Gentlemen, have you it in these welds? Is there any fibre in a weld? If there is, I have failed to observe it. Ever since Federal control of our railroads began I have been in position to give some of you engines for repairs. If ever I spoke the truth in my life, I will speak it now. The boxes were smeared from cellar to dome, and when renewed, they were the most awful sight a master boiler maker could behold! (Applause.) I use acetylene; I want to use it, but don't let's get too enthusiastic, don't let's do it for fear of failure. If that becomes too frequent, what will our superior to say to us? He will tell you, as he did concerning the shell of the boiler—keep your torch off that shell! Have any of you gentlemen ever heard that? "Keep your torch off the shell!" For God's sake, why? Because there is something wrong. It is not what they want it to be. If I make a demonstration and tell you I make welds; also that weaknesses present themselves by fractures, and cracks everywhere from an inch to four inches long—that is not what this association wants to indorse. If we do right, we will say, "be cautious, be careful!" The engines I spoke of are nine in number. Every one of them has all kinds of welding; patches on the side sheets; collars on the sheets with which I would be ashamed to acknowledge I ever had anything to do. The seams we welded up, the flanges, plastered on there in some places as thick as my hand, and longitudinal seams, they still crack. Some of our good welders will tell me, "you have a bad welder." I do not know anything about the man who did the job, but I have a welder, that, to my knowledge, has been in the business 10 years. If one of his welds cracked he would actually feel as though he had something stuck into him. We do not want the federal government to say, "Gentlemen, you must stop acetylene and electric welding." I believe that electric welding is a good thing absolutely, although I have not done any of it; but I have seen others who have. Some gentlemen will get on the floor, and seek to impress us with what they presume to be a fact. I do not want to cite them as prevaricators—do not understand me that way, because I do not mean it that way, because that is not my disposition. I would like to see this association make a record for itself, and everyone of us. If the gray matter is not with us, in the name of God, and our calling, where is it? Where can we go to look for it? We have representatives here whom we wish to carry back to their superiors the most enlightening reports. As I said in the beginning, be watchful and guarded, lest we fall! Thank you. (Applause.)

Mr. G. W. Bennett: I'm glad I have one friend here.

Mr. Brown: I am not biased. I am speaking from personal observation. I forget Mr. Bennett's remarks; I have not conversed with him; I came here to see his photographs, but unfortunately did not see them; so do not think I am working hand in hand with Mr. Bennett.

Mr. Hempel: The subject is one on which I hesitate to begin because I do not believe I could do it justice in the time we have. I believe we are among the pioneers in electric welding. Later we put in the acetylene. We now have 15 electric welding plants. Considerable has been said about electric welds. One gentlemen says, "How do you know an electric welder?" Let me say to him, "Educate yourself so you will know. You must first be one yourself." Another gentleman says, "I have handled the torch seven years, and I never made a perfect weld." He can handle it seven more, and he will never make a perfect weld, if that is his calibre. (Applause). How do you know whether he is an electric welder? If his fag end shows that the metal is oxidized, it is not a perfect weld. If the stick is just as bright as a silver dollar, you know he is getting metal. If it is oxidized, so you can break it, it is worth nothing. What is the electric welding proposition? It is purely scientific. You have to study it out; you have got to educate yourself. What is the fundamental principle of it? What is amperage? Amperage is nothing more than heat. Voltage is force. Harmonize the two, but cut down on your voltage. I showed Mr. Mathison of Salt Lake, a government inspector, where we had two failures in 350,000 flues welded with two volts and side sheets that had been welded three years. If these inspectors have any criticism, I would be glad to know it, but I am actually surprised by Mr. Bennett criticizing the weld first thing, because a locomotive failed.

I believe last year that I investigated more explosions than any man in this room. Some of them were due to failure through the weld. I do not know but what you may have that case right on your road, or we might have it on our road; it may be one of our engines. What difference does that make? One of the gentlemen who spoke told me he knew that the efficiency of that seam was not 100 per cent. The crown and side sheets would naturally come down to the side sheet where it was welded and would rip along that side sheet—the weakest point. There is no reason why we should condemn the acetylene or electric welding because it failed there, if the original box did not fail. It would not be necessary to weld with either electric or acetylene; both of those methods are for temporary repairs until you can bring your engine in for a new firebox. It is up to us to get the best we can out of those temporary repairs. One gentleman said something about electric welding flues. Mr. Pratt, when he was president of the Master Mechanics' Association, said: "Hempel, you tell me that you electric weld your flues on your engines at Cheyenne when they go through the shop?" I said, "Yes, sir." "Well," he asked, "Why don't you weld them at North Platte, where your water is bad?" I replied, "I knew you would ask me that question." That is just the question you all want to understand. Weld them where you ought to, and where you should not, do not weld them. The master mechanic changed Mr. Tottenhoff's territory. It was extended into a bad water district. I had agreed to weld the flues on engines as they went through the shops in the good water district, and the master mechanic thought he had something when his division was extended. He ordered Mr. Tottenhoff to weld some flues. When I got on the ground, Mr. Tottenhoff told me the master mechanic ordered him to do it. He brought him down, and I asked him about it. He said: "Why, you told me that it was all right to weld them going through the shop." I said, "Yes, but you have changed your territory—you are in a bad water district." So, I said to Tottenhoff, "Put in five sets of flues, following these five sets against those five sets, to show this master mechanic what he knows about the proposition; but I will tell you what will happen before we do it, but we will do it to prove it. You will get 90 days out of your flues electric welded in this district." I don't think they did so. All of the flues were taken out in from 90 days to 6 months. Why? Why, in a bad water district? Why, in a good water district? In a good water district, put your engines in the shop, electric weld your flues, and get 290,000 miles out of the engine without any firebox work between that time. That simply saves a little trip work—nothing else. In the bad water district, scale accumulates, and flue tools, expanders, etc., have to be used to keep it knocked out; when the boiler is dry, work your flues, knock the scale down, and get it out. With the electric welder it is not necessary to touch the flues. The result is that scale forms and there is no way of dislodging it. Therefore, your electric welded flues are no good in a bad water district. As to last four months of the life of a flue in a bad water district, we weld the flues to get just as much as we can and never touch them thereafter. We have some large engines that were built two or three years ago before the Federal Government took control. The combustion chamber, the back flue sheet and the throat sheet are electric welded. I want to ask Mr. Mathison if ever he saw a leak in one of those boilers? They are in his territory. If the government is going to find fault—and I presume Mr. Bennett spoke for the government—let some other man say something who is in the actual territory. I know you all can make good welds with acetylene; I know you can make them with electricity, provided you educate yourself, and your electric welder, but you first must know what you are doing yourself. Thank you. (Applause.)

Mr. Brown: As Mr. Hempel has had extensive experience in electric welding, is his confidence the same as to acetylene welding?

Mr. Hempel: Yes, sir. The acetylene man with his torch puddles for a half hour; does he know what he is doing? Is he oxidizing that metal, or feeding in pure metal? This applies also to an electric welder. An eighth of an inch wire, or any wire, will oxidize with an amperage too high or too low. It will oxidize below 76 amperage, and it will oxidize above 110. An eighth, a sixteenth will oxidize at 112 to 125 amperage. You have to work between these points. Your fag end tells you when you are working there? I favor electric welding in the firebox instead of acetylene, because there is a way to tell what metal is being put in the boiler. Weld three or four strips on the metal, change the rheostats, chip it off; and if it chips off, you know you are getting metal; if it breaks like glass, you know you are getting nothing. Test out the metal. I think I can convince any man at my office that acetylene may be good as electric, provided you have the right man who knows what he is doing. How can he tell? That is foreign to me. That is why I prefer the electric welding over the acetylene—because I do know what we are doing.

Mr. Brown: We will suppose that the statement made relative to the torn crown sheet in this engine was Mr. Hempel's; let us also suppose that Mr. Hempel would have the utmost confidence in that welding. Whenever we kill or injure a man in an explosion, our instructions tell us that the engine wrecked must lie there until released by the Federal Government. The Federal Government wants to know something about this rupture, or whether it was a weakness. Should Mr. Hempel so declare? How on earth are we going to explain it? It is evident that it is the inefficiency of that boiler—it matters not what caused the explosion. Let it be low water——why, gentlemen, I have seen, so have you, fireboxes literally torn out of boilers, and the sheets with them, through explosions owing to their severity. How could we place the responsibility for that accident? Would we say a faulty welder? We would not say that; it would not be accepted. That is why we should be cautious and careful. Don't become too enthused in this proposition. I believe, and I think you will agree with me, that perfection in acetylene or electric welding has not been reached. It is improving every year. We should not go into it too extensively—not until we can show the Government that our work is 100 per cent. We ought to work to that end. I may have an accident of that nature on the road with which I am connected. Uncle Sam will say, "This is getting too frequent. We will have to look into it." Mr. Hempel spoke of it as being a "temporary repair." I would not call putting in a crown sheet a temporary repair—would you? I think that is a pretty good repair, as I understand running repairs, temporary repairs in a round house, a terminal, or such as that; but when we get a locomotive into our respective shops, tear the flues out, and apply sheets, it will not come under the head of "temporary repairing," because we are trying to make a permanent thing of it. Let us make it so.

Mr. Wandberg: I fully agree with Mr. Brown in regard to the responsibility of this welding. Remember, gentlemen, that we have the supervising of this work, and are responsible to a great extent for work that is turned out. I do not believe it is good policy to use inexperienced welders in the firebox. Only a fully qualified welder should be put on a firebox job. I am not afraid to say that 90 per cent. of our failures—perhaps that is a little too strong—are due to the fact that we lack men of experience to do the welding. It seems to be an age when we want to rush ahead; we want to do away with rivets, and we want to do welding. We must first have men of experience. We should go slow. If we do not, the work will be condemned. If a man has had experience, and is given good material, he can make a good weld, otherwise we cannot deliver the goods. If we get a metal or a wire that is up to standard—as the best is none too good—it should not be changed every other day, or something cheaper tried. I am progressive and believe we should get our material as cheaply as anybody, but it should be tested in some other way than on a first-class engine, pulling an important train.

Mr. Elkins: We have been welding flues for your years. We weld every flue. Our heavy passenger engines run 26 months and make 100,000 miles without leaking. We also weld side sheets, fireboxes and patches with the electric process with good results.

A Member: How do you apply the weld—what preparation do you make?

Mr. Elkins: We set the coppers with the flue rollers, being very careful not to let the copper project between the sheet into the firebox. If any copper shows after the flue is beaded in it will spoil the weld. We expand the flue with the sectional expander and head the flues down good. An engine should be fired up after welding and brought to full steam pressure in order to burn off any oil or foreign matter that may be on the flues or flue sheet. We sand blast until we have the sheet and flue perfectly clean. We begin at the top flue and weld down, avoiding welding where there is any dirt or smoke on the flues or flue sheet.

Mr. Patrick: Do you weld with water in or out?

Mr. Elkins: With the water out. We tried welding with water in the boiler. It makes the best job with the boiler empty.

Mr. Patrick: What kind of water have you?

Mr. Elkins: Many kinds, as we operate in many parts of the country. At our particular plant we treat the water before we begin to weld. We had a good deal of trouble with flues leaking but now our flue troubles are practically ended. Some one spoke about welded flues causing the bridges to break but we have not had any trouble from that source.

Mr. Madden: On the lines of the Missouri Pacific Railroad with which I am connected we began electric welding flues about four years ago and have had very good success. Previously we experienced a great deal of trouble especially in keeping the superheater flues tight in the sheet. It was necessary to expand them at least every other trip. The flues were worked so much that our prosser expanders became too small for them and it was necessary to use flue rollers in order to keep the engines in service. The rolling of the flues enlarged the holes in the flue sheet to such an extent that after a few years it was necessary to apply new tube sheets. Since we began electric welding about 80 per cent. of this trouble has been eliminated. We have some failures which are due to the carelessness of the operator.

Our railroad parallels the Rock Island and Santa Fe Railroads in the bad water districts of Kansas and Colorado. Our engines are kept in service in these districts until the flues become pitted and corroded from the bad water. They are then renewed. We could not get along with our heavy power if the flues were not welded and are very well satisfied with the results obtained.

Mr. Patrick: How about the two inch flues?

Mr. Madden: Remarkable success from the beginning. We have had some failures due to improper welding. In the bad water district I have instructed our men to use their air hammer after the engine has been in the shop a few days. After an engine has been in service five or six months and is held out of service three or four days, we work a long stroke hammer with a bobbin tool on the face of the flue sheet to remove the scale on the water side of the sheet. We do the same with crown sheets. This prevents radial stays as well as flues getting hot and starting to leak.

Mr. Patrick: Do you treat water?

Mr. Madden: We have been doing so for some time.

Mr. Patrick: With what success?

Mr. Madden: Pitting of crown sheets, tubes and flanges of sheets has been eliminated to a great extent.

Mr. Patrick: How much mileage do you get out of a set of flues.

Mr. Madden: Our freight engines make 70,000 miles in about 22 months. Our passenger engines make 110,000 miles.

Mr. Patrick: How much mileage would you get if you did not treat your water?

Mr. Madden: An average of about 40,000 miles. Our treating plants have been in service for two years and our flues are running between shopping without being renewed owing to treated water. Electric welding has prevented trouble incident to flue sheets cracking between bridges.

Mr. Patrick: If a boiler fills up with scale in bad water territory so that the flues collapse, why weld them?

Mr. Madden: We have not had any collapses. The water seems to eat up the flues—eats up the nickel of the flanges.

Mr. Patrick: You do not have scale?

Mr. Madden: We have a scale an eighth of an inch thick around the flues, but it is very hard and water will not penetrate it.

Mr. Green: I have listened to different arguments on oxyacetylene welding since I attended the convention in Louisville. I was opposed to it for a long time. Within the last three or four years, I have been converted and concede that it is just as important in every railroad shop as air tools. I recall when we all opposed the pneumatic hammer and other improved tools and methods introduced into our shops. Oxyacetylene has saved the U. S. Government more money than anything introduced into the railroad business in a number of years. The man who does the welding is to blame for inferior welding, but we have to go slow. To be successful we must take more time and educate these men. You cannot make a welder in three or six months. It takes a year or two years to make a first class welder. Welding is a trade and I believe that 20 years hence boilers will be welded without a rivet in them. I do not think a shop in this country is complete unless it has a full installation for oxyacetylene and electric welding. You cannot do without either. I do not believe there is anything to condemn but the methods. I have made changes in mine. We are learning every day. If each man in charge of a shop will watch his failures and try different methods he will eventually conquer every trouble. We have very few now at our Beech Grove shops.

The President: It has been said a welder cannot be made in three or six months. Som men cannot be made welders in a life time. Welding is the same as boiler making; it depends upon the foreman. When a man is put on the welder and does not prove competent, he should be removed. He will not make a welder if kept there 10 years. (Applause).

Mr. Pack: I have listened more or less attentively to the discussion on autogenous welding, of the oxyacetylene and electric processes. Several gentlemen have alluded to the position the Government is taking in this matter. Mr. McManamy said yesterday, "You cannot build a boiler with the oxyacetylene torch." We are not opposing the method of welding where it is used to a reasonable extent, but I am opposing, and will continue to oppose its extreme use, with all of my influence, where I find it is costing people their lives through its failure. We object to the extremes to which some people have gone with the electric welding torch. We do not believe that it should be used in any part of the boiler which is wholly in tension while under working pressure, nor do we believe that it should be used to any great extent in welding seams in or near the crown sheet, for in almost every instance of a crown sheet failure, the welded seams in the fireboxes, where such existed, have failed their entire length and unquestionably, greatly increased the force of the explosion. At least it should not be used in any part of the boiler where it is liable to a great tensile strength until it has reached a higher state of perfection. We all know that it is impossible to always make a 100 per cent weld, even a blacksmith weld, and we never know what we have in a weld of this kind until it has been tested to destruction. Where life and property is at stake, as it is in boiler explosions, we believe it should be used with great care. We are not biased against any particular process or any particular appurtenance so long as they successfully and safely perform the duties expected of them. It is true, where these failures have occurred, in most all instances the primary cause has been low water, but no methods should be employed which would permit of greater destruction of life and property than possible, even though some human being has failed to perform his full duty.

On motion the subject was closed.

Mr. Patrick: I move that we complete the program for the day. Carried.

The President: Next on the program is the report of the committee on "What is the Advantage of Cutting off Stay Ends with Oxyacetylene Over the Old Method of Nippers and Chisels?" W. L. Larason is chairman of the committee.

REPORT OF COMMITTEE ON

"What is the Advantage of Cutting Off Staybolt Ends with the Oxy-Acetylene Over the Old Methods of Nippers and Chisels?"

As to the advantage of cutting off stay-ends with oxy-acetylene over the old method of nippers and chisel. Your committee believes the first thing to be considered is shop conditions.

In a shop that is equipped with crane facilities, where boilers are removed from frames and can be turned in any position, then the nippers can be used to good advantage. However, we have frequently heard complaints that the nippers do not make a good even end to drive, and it is very often necessary to go over the bolts and trim them with chisel before driving.

The use of the chisel in cutting off stay ends can hardly be considered, as it will damage the thread on the bolt and in the sheet; it also elongates the holes.

We believe the acetylene is so far superior to this method that there is hardly any room for discussion.

In using the oxy-acetylene process the bolts can be cut to a uniform length, with the boiler in any position.

It leaves the bolt annealed for driving. In shops that are not provided with crane facilities, for boilers with narrow fireboxes, for cutting off scattered bolts, bolts applied in patches and radial stays, or where boiler is on frames and in upright position and bolts are applied from the inside, we believe the acetylene has no equal.

As to the difference in cost this will depend a great deal on the operator, of either the acetylene or nippers.

Respectfully submitted,

W. S. LARASON, } Committee.
J. B. TYNAN. }

MR. PATRICK: I move the report be received and accepted with the following paragraph as the sense of this convention: "We believe that acetylene is so far superior to other methods there is hardly room for discussion." Carried.

THE PRESIDENT: Next in order is the report of the committee on law. G. W. Bennett, chairman.

REPORT OF COMMITTEE ON

"Law"

Amend SECTION 1, ARTICLE III, by striking out Fourth and Fifth Vice-Presidents, so as to read: "The Officers of this Association shall consist of a President, First, Second and Third Vice-Presidents," etc.

The recommendations were, on motion taken up seriatem.

Amend SECTION 2, ARTICLE XI., by striking out the word "shall" and substituting the word "will" so that it will read "will be valuable to the Association."

Amend SECTION 3 of the same article by adding after "active service" the following: "Or others whose experience will be valuable to the Association."

Amend ARTICLE XVI. by adding a new section to be known as SECTION 1, and change the numbering of present sections 1 and 2, to read 2 and 3:

SECTION 1: The President shall within 30 days following his election appoint a committee of three for each topic to report at the next annual convention on such topics as are adopted for that occasion, and also a committee of three to report a list of subjects in advance for the next succeeding annual convention.

Add new article:

ARTICLE XVIII: SECTION 1: There shall be a standing committee on law to consist of three members to be appointed by the President after assuming the duties of his office and such appointments shall include at least one member of such committee who served in such capacity during the year preceding an annual convention of the Association.

SECTION 2: At the first session of each annual convention the President is authorized to appoint for the period of such convention the following committees, and any additional committees which circumstances may make necessary for the time that the Association is in session:

Auditing
President's Address
Memorials
Resolutions.

SECTION 3: The President is further authorized to appoint annually a special committee of three, after the selection of the place of meeting for the annual convention, whose duty it shall be to arrange for special speakers, and make such other arrangements for the convention as may be found necessary.

G. W. BENNETT, Chairman.
J. T. GOODWIN,
N. M. O'CONNOR.

Opposing a reduction in the number of vice-presidents for the ensuing year, Mr. Patrick moved to agree with the report but that it be made effective one year hence.

Mr. Bennett, Mr. T. F. Powers and Mr. Elkins advocated adoption without the qualification named.

Mr. Patrick's motion was defeated.

Mr. Rice suggested that articles affected by the recommendations of the committee be read before action was taken. He deprecated any hasty procedure which might later be regretted.

Mr. Bennett read the other proposed changes, explaining why the committee favored them, after which, on motion of Mr. T. F. Powers, the report of the committee was adopted without amendment, as was also the following report of the committee on topics without debate or amendment:

REPORT OF COMMITTEE ON

Topics for Next Convention

In submitting the following topics for the 1920 convention, the committee wish to call to the attention of the members the necessity of compiling all of the data possible in order that the reports approved by the convention may be adopted as standard practice. It is the concensus of opinion that heretofore this Association has not arrived at any definite decision or conclusion on any subject discussed. Each subject should be fully developed by the committee and after careful discussion and revision, if necessary, should be adopted by the convention. In this way only will we attain prestige and be recognized as an authority on subjects pertaining to our vocation.

(1) What is the best type of washout plug, arch tube plug or cap to be used in order to overcome leaking, when boiler is under pressure? Kind of thread, number of threads per inch and taper per foot? Proper location of washout plugs in boiler?

(2) Which firebox steel gives the best results from actual service test; steel having a tensile strength of from 48,000 to 58,000 pounds, or 55,000 to 65,000 pounds per square inch?

(3) Is the superheating and reducing of steam pressure on boilers advantageous as to staybolt breakage compared with boilers of the same class not superheated?

(4) Is it necessary to maintain the cinder hopper on bottom of smoke arch of all locomotives? On what size locomotive should it be maintained? Which is the better design to overcome air leaks?

(5) Is the flanging of firebox sheets on the flange press detrimental to the material? When can cold flanging be employed to the best advantage?

(6) Oxy-acetylene welding, describe best method of performing various classes of work, including preparing, placing in position and welding cracks, patches and sheets?

(7) Electric welding, describe method of preparing cracks, patches, sheets and flues for welding.

(8) General discussion.

J. F. RAPS, Chairman
D. G. FOLEY
GEO. AUSTIN

On motion of Mr. T. F. Powers the convention adjourned until May 28, 1919, at 9 a. m.

THIRD DAY

The convention was called to order at 9 a. m.

The President: We have with us this morning a gentleman whom probably you all know. Mr. H. T. Bentley, Superintendent of Motive Power of the Chicago and Northwestern, who will honor us with an address. (Applause).

ADDRESS OF MR. H. T. BENTLEY

Mr. President and Members of the Master Boiler Makers' Association and Guests:

I have been very much surprised this morning; I did not think you started until 9:30; you are working on an eight-hour day basis now. I was told to be here at 9:30 and I thought I would steal a march to see if anybody was here at that time. I am glad to see that you are on the dot at the hour appointed for opening the session.

I have been attending your meetings as much as possible this week. One thing that impressed me was your evident interest and attention to what was going on. As you have some good subjects in your papers, reading and discussing them should enable you to get a better idea of the problems confronting us and learn by the experience of yourself and others how some of our difficulties may be overcome.

Under old conditions almost anybody could be classed as a boiler-maker and get away with it. (Laughter.) I was one myself for several years. In those early days, a mechanic had to be a boiler-maker, machinist, blacksmith, pipe-fitter—in fact tackle anything that came along.

Many a time have I caulked flues on top of a hot arch and made a quick exit through the firebox door when the gunny sack under me caught fire from the heat. (Laughter). So in talking to you this morning, I feel that I have a sympathetic audience and having been in the business, can appreciate more fully what you are up against.

Under present conditions, a first-class boiler-maker is a specialist and no hit and miss methods will do; with steam pressure from 150 to 240 pounds per square inch, the boiler must be maintained in good condition to do its work safely and efficiently, and with the labor saving devices now in use at all up-to-date shops, there is no excuse for not having it in that condition.

In the early days, practically the only tools used were hammers, mauls, chisels, caulking tools, drills, etc.; but now, to lessen the labor of employes and to increase the output, we are provided with oxyacetylene and electric welding and cutting apparatus, pneumatic tools of all kinds, flanging machines, rivet cutters, etc. With the good wages now paid, there should be a corresponding increase in output, so that the Government we are all working for, will feel that the increase given the employes is appreciated and results obtained justify the action taken.

The railroads before the war had a number of things lined up to do that would improve the service. Probably nothing in the Motor Power Department would give greater returns for the money expended than providing water purifying and hot water washout plants. All of these plans were temporarily side-tracked during the strenuous times just past. Now that the war is over, I believe these plans should again be given early and favorable consideration and plants installed where it is known that the expense is justified.

It costs much money to maintain and operate a locomotive and furnish water for its use. With good water and its freedom from boiler troubles, failures on the road and maintenance costs are low; with poor water, the conditions are changed. We have high maintenance costs, inferior service on the road, delays at round-house and a disgruntled superintendent.

On some roads using good water like Lake Michigan, a firebox will last 10 years or more and flues will run the limit and with little or no trouble. With certain poor waters, side sheets will last from nine to 12 months and flues about the same time. Money must be spent, either to purify the water and keep the engine in service or make frequent repairs and have occasional failures. In my judgment it is far better to furnish good water and obtain good service instead of poor water and poor service.

I know boilermakers are of an inventive and ingenious turn of mind and are also fond of making a little money as a result of their ingenuity. I suggest that an easy way to do so is to get up something simple and cheap that will actually overcome the pitting and corrosion of boilers and flues. I am sure you will find a good market for it.

One important thing that boiler and other foremen should get together on and that is the balancing of work so that necessary boiler and machinery repairs will be made while the engine is out of service to enable a locomotive to go out of shops and perform a proper period of service without trouble from boiler or machinery.

On several occasions it has come to my attention that an engine will be out of service, having wheels dropped and quite heavy machinery repairs and a few weeks afterwards the same engine will come back to the shops for new flues or side sheets. Of course, nothing will be necessary to the other part of the locomotive. In this case the engine is out of service for two periods close together, whereas, all of the work could and should have been made at the same time.

One of the serious troubles experienced by many railroads is the cracking of flue sheets from top row of flues out to flange of sheet.

Some of this trouble can be overcome by increasing the distance of flue holes from flange. So much of this trouble is experienced that a paper might be written and much valuable information obtained on the subject of: "How to Prevent Flue Sheets from Cracking from Top Flue Holes to Flange."

We made an investigation of the cracking of modern boiler shells at horizontal and circumferential seams and were not able to get very much information, most roads saying they had little or no trouble in this direction.

On modern boilers with thick sheets, punching holes is more harmful than on thinner plates. All holes in a boiler that can be drilled should be and the punching of such holes be discontinued.

The electric welding of two-inch boiler flues in the back flue sheet is something that interests me. A number of my friends tell me that by welding these flues, all troubles from leaky flues will be over, and work in round houses materially decreased. We have tried it and find that with good water the flues do not leak or bridges crack and therefore welding is unnecessary; with poor water it is very desirable to do this, if you do not run into other troubles. We bought 26 new boilers some time ago from a locomotive company and specified that the two-inch flues should be welded and after three or four months service the flue bridges cracked and new flue sheets had to be applied. The same thing occurred with some modern power. I would like to find out where you stand on this and perhaps a paper entitled, "Is the Electric Welding of Two-inch Boiler Tubes in Bad Water Territory a Success?" would throw some light on the subject.

The welding of superheated flues appears justifiable by reducing troubles on account of leakage and overcoming engine failures, and if this is so successful, I cannot see why the welding of small flues would not be a good thing.

The Federal Locomotive Inspection Department has been responsible for a great improvement in the condition of locomotive boilers, etc., and a closer co-operation on the part of the mechanical officials with the inspectors will bring about a still greater improvement.

The burning of oil in a locomotive, introduces many problems that are not met with in bituminous or lignite coal burners: projecting rivets, radial stays and thick seams that were satisfactory for coal burning, caused trouble when used in oil burning engines. The use of thinned seams, countersunk rivets and tapered thread radial staybolts with rivetted heads, instead of the button head formerly used, overcame these troubles. The breakage of staybolts, which causes very little trouble with good water and bituminous or lignite coal, is a serious trouble with poor water and with oil as fuel. It is possible that you have overcome this trouble and if so, it will be interesting to know how it was accomplished.

I understand that Mr. Aishton, who was talking to you the other day, told you how to clean flues, wash boilers and do a hundred and one other little things that the boiler maker foremen are called upon to see are properly done. I am glad he did it, because it is something that is of very, very great importance. Some boiler maker foremen (not those in this room) I have known did not feel that it was their duty to check up and know that flues were kept properly cleaned and the boilers were properly washed out. That is a boiler maker foreman's job. He does not have to go into every engine, but if the flue cleaner knows that there is a wide-awake boiler foreman who occasionally puts on his over clothes—some men wear them all the time—and goes into the firebox and checks up to see that the flues are clean, he is going to get busy and see that they are clean. It is the same way with washing boilers. If a boiler washer sees that a boiler foreman comes around when the washout plug is out and says, "Bill, bring me a light, I want to look in there and see if you made a good job." It will make him more careful. The fact that you have gone out of your way to ask the boiler washer to let you look in and see that he is doing his work properly, is a great help in keeping the boiler clean.

Presume you have all looked over the exhibits that the manufacturers have so kindly brought here for our information and education, if you have not done so would suggest that you make it a point to see what they have to lighten your labors and increase the output.

Personally I feel under a great obligation to the manufacturers who are progressive and anxious to conform to our requirements in designing and turning out tools, etc., and the least we can do is to look their services over so that when asking for authority to order such things we will be able to do so intelligently and know all about the things we are calling for.

I am delighted to be here today and to have had the opportunity of saying a few words to you. Unquestionably the maintaining of boilers is one of the most important things there is on a railroad. If we have poor boilers, we have a poor railroad. I am glad to see so many men here. From the information I have obtained and my visit here yesterday, I am satisfied that you are transacting business, and when you get home again you will put a lot of new ideas into practice and get very much better results. I wish to congratulate you all on coming to such a wonderful city; Chicago is the only city in the world. I get a little money for saying that, because you are going to have your next convention here. I sincerely hope that your stay here and your attendance at the convention has done you much good. Thank you for listening. (Applause.)

The President: Mr. Bentley, I want to thank you most heartily, in behalf of the Master Boiler Makers, and we request that you spend all the time you can with us while we are in session.

Mr. Bentley: Thank you.

The President: The next subject on the program relates to the drilling of tell-tale holes. Mr. L. R. Porter will please open the subject. If he is not in the room, Mr. A. N. Lucas, will open it.

REPORT OF COMMITTEE ON

"Best Method of Application and Drilling of Tell Tale Holes," Etc.

The best method in all cases to apply tell tale holes is before the staybolt is applied. This may be done on an automatic drilling machine or a small drill press rigged up for this in the shop.

I also believe that it is the most economical and best method to cut the bolts off with the oxy-acetylene torch, in this way not disturbing the bolt in the sheet as is done with a hammer or a chisel bar, or staybolt nippers.

It is the practice in our shop to punch the tell tale hole in the staybolt on a forging machine in the blacksmith shop. This is done in one heat in two operations; first a rather blunt tool is used which punches a hole about 3/8 inch in diameter to about 5/16 inch depth, which acts as a countersink on end of bolt; the bolt is then raised in the die and a 7/32 inch hole 1½ inches deep is punched.

Personally, I am of the opinion that this is the best method known of applying tell tale holes in staybolts. If the dies are properly made the result will be a bolt of proper size with the tell tale hole in the center.

For drilling tell tale holes we use a 7/32 inch high speed twist drill both in new bolts and in opening up old tell tale holes. However, where holes are forged as above mentioned, we do not find it necessary on new bolts to use a drill as the holes can be very easily opened with a taper pin.

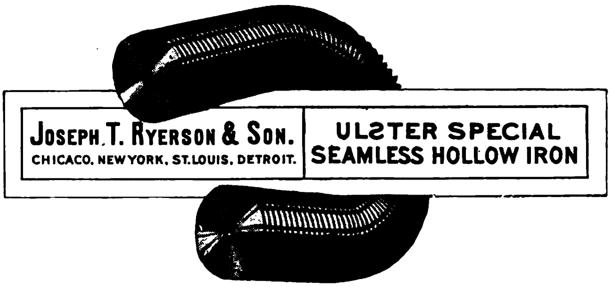
Lubricant used in our shop is composed of soft soap and water, both for drilling and for opening up new bolts.

Hoping this paper will not be too late for publication, I remain,

Louis R. Porter, Chairman
A. N. Lucas
Barnard Wulle
Committee.

DISCUSSION.

Mr. A. N. Lucas: I do not think I can tell any of you how to drill a tell-tale hole or open it up. We all ought to understand that pretty well. I believe many punch staybolts in the blacksmith shop before they are ready for application. We punch our tell-tale holes in the blacksmith shop with very good success. Where we punch the holes, the metal is also countersunk three-eighths for the full diameter of the drill, so that when the bolt is set in and hammered up, it does not close



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the tell-tale hole which is readily opened with a drill or reamer or pin.

Mr. Powers: What is your percentage of failure with punched bolts? Another point is whether it is cheaper to get an engine through the shop by putting in all bolts from the inside and cutting them off, or using hollow iron, or drilling the bolts from the outside?

Mr. A. N. Lucas: In punching the tell-tale hole in seven-eighths bolts, they occasionally split, but in the fifteen-sixteenth, where the punch is used properly and in the center, we do not have much loss through the tell-tale hole.

Mr. Powers: What is your percentage of loss?

Mr. Lucas: Well, I haven't it, but I know it is small. We put all our bolts in from the outside. Where you have to square the bolt or cut it off, deliver the iron to the blacksmith shop and then to the threading machine, then drill tell-tale hole, it would be a good idea to use hollow bolts as a standard. They can be bought about as cheap.

Mr. Charles Zeats: Formerly we applied the staybolts from the outside as well as the inside. We drilled the bolts from the outside. Not one man out of 10 will drill them in the center of the bolts. The object of our practice is to avoid—well, you might say, insurance companies. For instance cases happened on the Rio Grande System where we nipped the bolts off with shears, left a very small chip at the end of the bolt, when applied from the inside, struck a man in the eye and destroyed the sight. After that bolts when drilled, were countersunk about three-eighths of an inch deep and the edge of that bolt faced. After bolts are applied from the inside, it will take a day and a half to three days to apply them in the firebox, because it is almost impossible to put more than two gangs on the work.

Mr. Madden: The bolt that is punched could be applied from the outside as well as the inside. Many roads put in bolts that way after they are threaded.

Mr. Powers: For many years on the Northwestern we squared all our bolts. Some time ago we went into round-headed bolts and found we were losing from five to seven hours on every job.

Mr. A. N. Lucas: You saved money by squaring the box. We believe that the best method is the square staybolt.

Mr. Wandberg: On the Chicago, Milwaukee & St. Paul, we square our bolts, putting them in from the inside, whether drilled or punched. Of late we have begun punching the bolts. We experimented by countersinking the staybolt hole and found by using a taper drill it is not necessary to open up the hole afterward. It did not close.

Mr. A. N. Lucas: Wearing an old glove or using a piece of waste when passing out the bolts is very dangerous. Men have had a hand hurt or an arm pulled out. We use a piece of old pipe with a tap at the end. The man handling the tap never touches it; he hands it out under the mud ring or otherwise.

Mr. J. L. Diddier: We drill a hole before applying the bolt, making the application from the inside of the firebox. It is a good practice, as a man can tell if there is a tight fit in the firebox side. If the bolt splits from the firebox side and runs into a loose hole from the outside of the sheet, it is easy to know whether the bolt is good. When bolts are put in from the inside and supposed to be a nice fit, it is found they can be moved in the hole to a certain extent. The question arising is, how loose is the bolt? Put the bolt in from the side opposite the tap hole. If the hole is tapped from the outside, the bolt should be applied from the inside.

Mr. R. C. Young: To procure a tight job, it is necessary that the work be done in a more thorough manner than is generally the case in applying solid staybolts where the detector holes are drilled after bolts are hammered up. The holes in sheets should be a snug fit and the thread on the bolt should conform with the thread in the sheets so that when the second sheet is reached it will enter and run smooth, the thread on the bolt filling the thread in the sheet. When a solid bolt is hammered up it is hit in the center and upset back in the sheet until it fills the hole tight. With a drilled and countersunk hole on the outside it cannot be hit in the center. It is driven back around the edge of the bolt and has a tendency to spread out over the sheet.

Mr. Strinsky: On the St. Paul we drill all our bolts and countersink them before applying them from the inside of the boiler. Bolts must be heated on the end to punch them, and the hole is supposed to be punched in the center. I never had any experience in punching holes. I do not think the hole could be punched central all the way. Equal heat on each bolt may not be obtained. It is thrown on the floor, will probably get wet and crystallize, and when put in more staybolt breakage follows. The material when received is supposed to be annealed, and the proper way is to square one end of the bolt.

Mr. J. T. Mitchell: The best method is to drill stay bolts before they are applied and screw them in from the inside of firebox, when

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it is possible to do so. In drilling tell-tale holes in staybolts after they are applied it is difficult to keep in the center of the bolt, especially in bolts that are hanging at an angle. If the hole is drilled to one side of the center a bolt might be fractured half way. This would not be shown under steam pressure and would be hard for an inspector to find in testing the bolts.

Mr. Lewis Eberle: We punch all our staybolts in the blacksmith shop. We never have any bother with them. We run them in from the inside. Once in a while we punch one on the outside, but throw it out. We punch them with the Ajax. Mr. Nicholson can vouch for what I am saying.

Mr. Nicholson: I believe the originator of the punched bolt was Mr. Cook, of the Bessemer. When I served my time under him he started punching bolts and had very good success. As far as throwing them down in the water after being in the fire, I have never seen that done in a modern shop. They always rack them where they are in piles, and that practically anneals them to a great extent.

Mr. Frank Berrey, of the Erie: We have been punching bolts for many years in the blacksmith shop. Unless great care is taken, the punch gets hot and bends, throwing the hole out of center. We have found many bolts with a hole in the bottom from a sixteenth to an eighth of an inch from the root of the thread. If a bolt fracture began from that side, it would have to be removed. We also found in many cases, a large supply of bolts in the furnace, and some get overheated. The punching of bolts would be all right, providing time and care is taken, but if the job is hurried many bolts will be ruined.

Mr. Fogarty: We apply our stay bolts from the inside of the firebox. We have done so a good many years and have had good results. We drill all our bolts on a spindled drill and countersink them, but I believe Mr. Lucas said that after driving the bolts you do not have to open them up. If you do not upset that bolt, you might not have to open them up. Our method is to take a three-eighths drill and open up the countersunk parts. Outside of that I would say the bolt was in first-class condition.

Mr. Reddy: We drill our bolts first and apply them from the inside. Instead of countersinking, we counterbore a little, which helps materially in opening up holes. It was my impression that in gripping the iron to punch the hole, there would be a reduction of the metal.

Mr. C. R. Bennett: The Government, the Master Boiler Makers' Association and this committee are on record to do away with punching boiler plate as far as possible because it has been proven that punching boiler sheets for rivet holes, damages the efficiency of the plate to a certain extent; therefore we have eliminated this practice by punching the holes in sheets ⅛-inch smaller than required, finishing the holes with a drill, to the required size. Do we now want to go on record in favor of punching tell-tale holes in staybolts as the proper method when we know that it causes defects in the material and injures the make-up of the material by heating to an uneven temperature? All staybolt iron is required to be perfect when leaving the mill, and I believe in keeping it so. Therefore, the proper way to make tell-tale holes in staybolts is to drill them. If the right kind of machine is used, they can be drilled cheaper than they can be punched; and by drilling them instead of punching them, the material remains in its natural condition, or the same as it was when it came from the mill; and the material in the staybolt should be just as perfect when the staybolt is applied as it was when it came from the mill.

Mr. Elkins: Some years ago we went into the business of punching staybolts, putting them in from the inside and had a very large percentage of breakage which was attributed to the fact that we were not heating the bolts uniformly. At present we are drilling all staybolts we use and putting them in from the inside.

Mr. Laughridge: Will Mr. Wandberg tell us whether he ever had an etching made of the metal at the bottom of the hole where they punch it, to find out what change takes place? I do not believe in changing the metal in a staybolt a particle. Keep it in the same condition it was when in the mill. We punched staybolts 10 or 12 years ago, and quite because we did not get a good job; the punch would be dulled and the hole would not be of full size. It could be reamed out because one could not buy enough drills for that purpose and we could drill them cheaper.

Mr. Wandberg: I have not made a test to determine whether any change in the metal took place, except with the drill or a saw, and did not detect the slightest change. It is as easy to tell when the hole is central in a bolt as in a drilled bolt. We use a radial drill when we put in six bolts. I found many run to one side for some reason. With punched bolts, every bolt is gaged. If the gage stands at an angle, we throw it out. The hole is straight.

Mr. Walla: We have a few old timers in the punching game in this room. Mr. Rapps who used to be in Waterloo, and Mr. Fisner, who is there now. Let us hear from them.

A Member: I believe Mr. Conrath can tell us more about that than any man in the room.

Mr. Conrath: I punched bolts 20 years ago. The only objection to punching is the liability of overheating. By using a piece of drill

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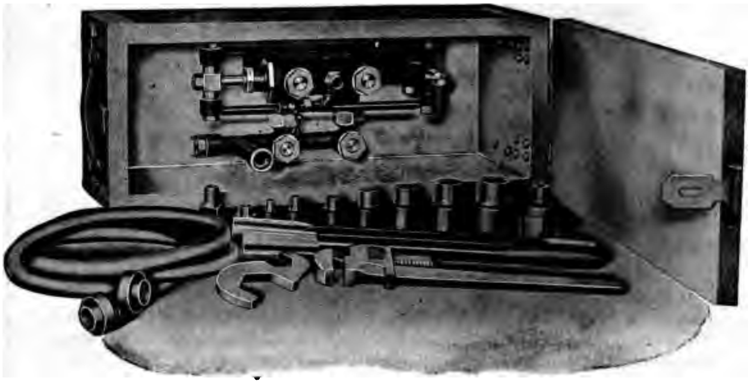

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rod cut into small lengths, and making a friction nut that will hold, the drill does not need any shoulder. The punch is very cheap. The bolt is much softer after being heated, piled up and allowed to cool off than it was before. Bolts should be applied from the inside. You get a better fit. Boiler makers here know they can make a tight joint on the outside with a hammer. If you have a fit on the inside, you are that much ahead because you have a bolt you know is just exactly the same as the fit. When you run it from the outside you cannot judge because you fit it to the outside sheet, and as a rule the sheets, where the bolt is being renewed the second time the hole is somewhat larger. When it hits the inside sheet the thread is liable to strain. If there is any variation between the die and tap in the pitch of the thread, bolts should be matched to the tap before they are applied in the sheet, as with some of our old machines in cutting staybolts the lead screw may be bad, or, in some places, they do not use any lead screw and there may be some difference in the pitch of the thread.

Mr. Borneman: Tell-tale holes should not be drilled in a staybolt. Our practice has always been to use hollow bolts and put them in the breaking zones behind pads and frames. Much labor is saved. It is our intention to order that all our hollowed bolts be of required lengths and put in from the outside. In that way their efficiency will be assured.

Mr. Tate: The Pennsylvania Lines East drill all their holes on a machine in the bolt department. It is strictly a bolt room proposition with us. No heating on a staybolt is allowed. The staybolt is squared by a press while cold. It is cut off cold. It is drilled cold. It is riveted cold. All manufacturers make staybolt iron to be handled cold. They get it from the factory as it should be used. While there may be something in punching staybolt iron I have failed to find anyone unwilling to admit that they got a percentage of bad work in punching—without a deterioration and destruction of the material used. The steel bolt may be another proposition. We handle iron bolts.

Mr. Powers: This problem has been solved for us and some of us have not taken advantage of it. The best way is to buy hollow iron. The hole is in the center and bolts can then be put in from either side. How many of us have been in the round-house when bolts were furnished with tell-tale hole only on one end about 1½ inches deep? When a broken bolt is found back of an arch tube or in the corner of the firebox, it can not be inserted from the inside of the firebox. It goes in from the outside. It can't be drilled—the pipe and tube taking up too much room. The Government inspector finds it and orders the engine out of service. Hollow iron is here. The only objection to its use for full installation is that of cost. General use and its purchase on a tonnage basis is the remedy. It costs money to put in solid iron. Even with increased cost, hollow iron comes nearer to being as cheap as solid in view of the money invested in drills, air, air hose and labor.

The President: In the discussion, yesterday, it was admitted that the side you tap from is slightly larger than the one where the tap finishes. Do you not think that the side from which the staybolt is tapped, is a few thousandths larger than the inside hole? If the tap is from the outside, the larger hole is on the outside; if from the inside, the larger hole is on the inside? By running staybolts in from the inside, the advantage of the full thread is assured as well as the full size of the bolt at the butt end where the thread is bound to be —where your die stops. Bolts give no trouble on the outside after they are put in and properly driven. The inside needs to be protected as that is where trouble occurs.

Mr. Young: I believe in drilling the bolts and applying them from the inside, hammering up and countersinking them. In applying the bolts the mistake is made of not paying attention to the tell-tale holes. Federal inspectors treat them the same as a broken bolt. Round house men should pay attention to tell-tale holes and see that they are applied. Punching is as old as the hills; it has been rejected, tried again and rejected again because it split the bolts.

Mr. Borneman: Never tap staybolt holes from inside the firebox. The motor always creates a condition that assures the size of the hole. Outside the firebox is the place where a proper fit is obtained.

Mr. H. Boersig: We drill and countersink staybolts in the northwest before applying them. It is probably the best method. We are equipping our engines with flexible staybolts as we find breakage and tell-taling necessary on a rigid bolt is overcome.

Mr. E. L. Hunt: The cheapest and proper way to apply a rigid bolt is to drill the end before it is applied and screw it into the sheet from the inside of the firebox, cutting it off with the oxyacetylene torch to prevent stressing in the inner sheet.

Mr. Walla: Let us not make the mistake of applying hollow iron staybolts until we get a decent grade of iron. Don't incur the trouble I jumped into. We had a grade of iron made in halves, with a hollow in each half, and then welded. Backing up and hammering those staybolts splits them in the center owing to the excessive hard driving necessary to put a bolt tight in the hole. Somebody ought to get busy and produce a grade of iron that has a wire drawn or cold drawn hole or some other process, so we can get away from fractured bolts in the center that are not made defective by breakage due to the vibration of

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the boiler. Another objection to the hollow iron staybolt is that if there is leakage in the firebox and the boiler is under steam, and the engine is outside waiting to go, the Federal Inspector comes along and says: "I will look her over before she goes." A little drop of water is coming from the tell-tale hole owing to some defect inside the firebox you have not seen. Should he find two of those together he orders the engine back into the roundhouse. You haven't any recourse, as you have a hollow bolt and you cannot drive them so tight that they do not leak through. That has been my experience. I have heard all the members talk about what is good and what they are doing, also of that with which they are having success, but I have heard nothing about what does not give success.

THE PRESIDENT: Can money be saved by using the staybolts entirely, taking into consideration the drilling and all the extras?

MR. WANDBERG: When we were drilling the bolts, I found it difficult to get drills of sufficient length and had too much waste on the drills. Putting a cap on the end of the bolt would naturally take away still more of the drill.

MR. ZEATS: We use a high speed drill, and drill the bolts an inch and three quarters to two inches.

MR. WANDBERG: The chuck of your drill was an inch; that left you two inches of drill.

MR. ZEATS: Yes, the cap was an eighth of an inch thick, and it is absolutely necessary that the drill be held at all times in the center. When cap is hit it shows the drill is going in the center of that hole.

MR. WANDBERG: How much of that drill could you use? What is the waste of the drill?

MR. ZEATS: When the drill is worn down two inches, we turn it over to the man cleaning up the tell-tale holes. After we get the bolts hammered up in the box, we turn the drill over to the boiler maker who opens up holes and cleans out tell-tale holes. Any surplus is turned over to the machine shop.

MR. WHITFIELD: The hollow staybolt is no good in a fire and never was. The metal contracts and the pores fill up. By putting bolts in from the inside and drilling and countersinking them, a tight fit is obtained.

MR. HEMPEL: We apply our bolts from the inside because a better fit is obtained and there is a saving of material. The bolts are cut to length and about one inch is left on which to put the tool to screw the bolt in. The bolts are all nicked to length, leaving when the fagged end is broken off, a perfectly square bolt, so that when it is driven, you have a good bolt to drive—not one that is slanting from nipping off. The cutting is done with a chisel. We should not apply the bolt and then strike it with the chisel and disturb the thread, because it takes force to cut it off. After being applied, the bolt is driven on the outside. The last performance is on the inside, to make it proper and tight. So far as the drilling of the hole is concerned, I will admit that we are open to criticism. I am not positive myself that the punched bolt is just the proper thing, but there are reasons for punching. The outside is not so material, and if the bolt is somewhat destroyed, it matters not if it is on the outside—that is, with respect to the scale formed from the punching of the tell-tale hole in the bolt. My only objection is that you have to heat the metal to too high a temperature to punch the hole. If you could punch that hole at almost annealing temperature, it would be better. I am not wholly satisfied and I am glad Mr. Young told you what he saw in Omaha.

Mr. Young: That was before your time, though.

Mr. Hempel: It is there today, no matter whether it was before my time or not; it is what we are doing. If we are not right, we should get away from it. Mr. Lucas told you the practice of the Burlington. It was followed when I had charge of that shop. He applies his bolts from the inside. They punched them then; I do not know whether they do so now, but I believe in a good, drilled hole; I believe in a good drilled hollow stay-bolt. We are now appying drilled hollow staybolts. I think it is the coming thing. The matter of first cost amounts to nothing. (Applause).

Mr. Strinsky: Some years ago a railroad on which I was employed had small hot punched bolts. I tested staybolts for two years on 86 engines and once a month found more broken staybolts that were not punched than later on roads where they were drilled. Heating the bolt on the end will injure it.

Mr. McGonigle: At the shop where I am, the blacksmith foreman handles the punching of the bolts and uses the five-eighth high speed punch, turning out as many as 2,000 with one punch. Practically none has to be thrown out. A shoulder on the punch countersinks the bolt the same as we countersink with a drill.

The President: Every point of the topic has been touched on with the exception of "What is the best lubricant for the drill?" I'd say oil, most any time.

On motion the subject was closed.

The President: The next subject is the best style of grate for bituminous coal, etc., Chairman, Mr. Laughridge.

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BEST STYLE OF GRATE

Mr. Laughbridge: I regret that I was unable to prepare such a report as we should have on this subject. When I accepted the chairmanship of this committee about six months ago, we anticipated changes in grate bars and ash pan openings. We had to take into consideration the stoker part of the subject. We use two kinds of stokers, and have been experimenting on grates. I recommend that this subject be continued, and that whoever is on the next committee, pay especial attention to large engines with stokers. All without a stoker will have them. There is a difference in the grate bar stoker and hand firing. We have found that out. We have had stokers five years and made changes on 10 engines with very good results.

Mr. Stewart: We use only a rocking table grate in all classes of engines. It has a five-eighths wrought iron rod with a grate cast around the rod, so that in case the grate breaks it does not fall into the ash pan and cause engine failure. We have not used the dump grate on the Atlantic Coast Line in 10 years. We had many failures from dump grates from various causes. The rocking table throws the grate toward the front for cleaning the fires. The rocking table grate has an area opening of 42½ per cent. which is all that can be provided without weakening it too much. On our latest engines we provide an air space of 14 per cent equivalent to 15 per cent of the grate area of the firebox. In some engines we have 14 per cent; in others as high as 16 per cent. I think the opening might be increased. There is a tendency in that direction.

Mr. Whalen: What quality of coal is burned on the Atlantic Coast Line?

Mr. Stewart: Very fine coal.

Mr. Whalen: Does it clinker?

Mr. Stewart: Some, as it does on most roads.

Mr. Whalen: In a run of 200 miles on my road, a clinker forms that requires the entire firebox to be pulled out.

Mr. C. R. Bennett: When you made out that report, did you consider your local conditions or the country's conditions? You do not specify what kind of coal you were using, under what conditions the grates gave service, or anything of that kind.

Mr. Stewart: On the Atlantic Coast Line the rocking table grate is the standard. Our road runs from Richmond down through the Carolinas, Georgia, Florida and Alabama. We use a cheap grade of fine coal. It does not require any picks on the engine to break it up.

Mr. A. N. Lucas: During the past 18 months, we have used the box grate, nine inches high. When we dump it forward we get an opening of about eight inches between the grates. I do not believe in dump grates. We are getting Indiana and Illinois coal and Iowa rock. We have some clinker, but get it out.

Mr. Stewart: Since interchanging engines in our country, we have found some requiring six different kinds of grates to make an assembly in the firebox.

Mr. C. R. Bennett: I do not know much about grates, as the work is handled by what is known as the grate gang, under the jurisdiction of the erecting gang foreman. About all of our freight locomotives are equipped with under feed stokers and we use what is known as the basket type grate. We have a flat railroad, and with the prevailing tonnage hauled, the locomotive must be worked to its full capacity. As there is comparatively little or no drifting, the fire must be kept in the best possible condition. The fuel is Indiana coal, and contains many impurities which form slag. We have experienced much trouble with flat grates, owing to the slag running through the grate fingers, which in turn cool off and lock the grates, so that they become in-operative after about one third of the trip is made. This resulted in designing what is known as the basket type of grate, which is fastened on to square shafts running length-wise of the firebox. The center is about six inches below the top of the stoker troughs. This grate gives better service than the flat grates, but is more expensive to maintain.

Our terminal points where fires are cleaned are about 60 miles apart. In some cases our fires are in very bad condition, with clinkers so large and gummy that it is a very difficult matter to get them through the dump and into the ash pan. We feel that we get better results with the basket grate, as it prevents the stoker trough becoming clogged and the plungers fouled. We also can more readily stir up the slag which forms on top of the grates when basket grates are used, as the flat grates have a tendency merely to raise the dead fire up and down, but do not get rid of any slag.

Mr. Smith, of the Burlington: Mr. Stewart asked why it was necessary to have so many different patterns of grates. I would say that on our road, where lignite coal is burned a grate of the description he gave would be entirely out of place. Grates are a local condition.

Mr. J. G. Reese: We do not use dump grates on U. S. engines running into Savannah. We do not need them. We are using Illinois coal with good success. Dump grates are a nuisance and cause failures and delay. We use box and finger grates with a good tip. With the aid of a slash bar the fire can be easily cleaned or knocked. As a result we have discontinued firebox cleaners which formerly cost us much money. The

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box grate having a large opening, it is easy to break up the clinkers and knock them through. With the steam and hand shaker the time between fires is short. Dump grates should not be used.

MR. STEWART: An expression from some of the members about the percentage of the draft opening in the ashpan, as compared with the grate area would be instructive.

THE PRESIDENT: The Burlington uses the best grate I know for all conditions. This was the opinion of three of the leading boiler makers in the country who were sent as a committee to look over the grate situation. Dump grates with a long rod running under the grate are a nuisance. The proper grate is one that will permit of the removal of the fine clinkers. More damage is done to the boiler in trying to remove clinkers than in any other way. With an 18-inch dump grate thrown open and pinned, when it swings up from the center an opening is left through which a man can crawl. Then the shaker bar can be used effectively. On the road the use of the dump grate is not necessary. The shaker grate serves the purposes of two-thirds of the grates used on the different roads.

MR. JACOB: We have the best grates on the St. Paul and it is a good thing because dump grates cause more aggravation among boiler makers than anything else connected with the firebox. They are a nuisance.

MR. NIMMO: Local conditions and coal govern the dump grate proposition. The Santa Fe is now testing out table grates on light Mikado engines. We found it difficult to remove clinkers from the firebox of an engine after it had been equipped with a dump grate and run a week. On the Illinois division in winter, with an 18-inch dump, we had to put helpers in the firebox to remove the clinkers. On the west end we do not use dump grates, but on the eastern end they are used owing to the kind of coal burned.

MR. WALLA: Where the dump grate should be located in road and switch engines has not been dwelt on. Most of our troubles with dump grates have come from their being located in the forward end of the firebox. I do not think it is necessary, in some classes of power, to have dump grates at all; but I think it is very necessary, on a switch engine, to have a dump grate in the rear of the firebox. I had experience with 1917 Illinois coal and Iowa rock, all last winter and it caused no end of trouble. When we put a dump grate in the back end and properly maintained it, we had no more trouble. We can knock a fire on any Northwestern or Omaha engine in as short a time as anyone. We use dump grates and do not have any trouble because we keep them up.

Grates are as essential as flues in a boiler, and if properly cleared will not cause trouble.

Mr. Elkins: I think that heretofore we placed two much confidence in the air openings in the front and rear of the fire boxes. Experience has taught us they should be on the sides of the ash pan to allow for proper combustion. On the Missouri Pacific we figure from 14 to 16 per cent of the grate area for air space, with as much of it on the sides of pan as possible. We have very little trouble with grates clinkering or ash pan burning out. A great deal of the latter trouble is caused by the engine not getting enough air around the mud ring at the top of ash pan. All of our dump grates are placed in the back end of the fire boxes and are so constructed that they can be dropped from the engine deck to allow the firemen to clean the fire without leaving the engine cab. If the dump grate is placed in the rear of the fire box where it should be and is properly maintained I see no reason why there should be any engine failures from this cause. It is certainly a great advantage to have the engines so equipped.

Mr. Whitfield: A dump grate on an engine results in too much dead coal and after a while the air does not get through. With the box grate the entire fire can be dumped at once. It saves time in getting an engine out on the road. Big clinkers are not easily broken up on an engine having a grate without fingers. It is necessary to use a slash bar. With a drop grate having holes through it, the fire can be handled in 10 or 15 minutes. Otherwise it will sometimes take an hour to knock a fire. As to the ash pan proposition, I believe air ought to be taken from underneath the mud ring.

Mr. Shumaker: Where I come from if you dump ashes on a trestle, your job is gone. We use table grates and can clean a fire in a few minutes. If tried they will be found satisfactory.

Mr. Charles Miller, of the Virginian: We intend to abandon the drop grate and use the table grate altogether.

Mr. H. K. Gill: We had two engines equipped with caterpillar and dump grates and when these engines arrived at terminal points it would take from one to three hours to knock out the fire. The service was so unsatisfactory from these grates that we changed them. We applied the Standard Table Grate after which we could knock out the fire in from 20 to 35 minutes, according to its condition. We also improved the standing of the engines and effected a saving in coal.

Mr. Diddier: We have the shaker grates which are standard. We have not used a dump grate in 12 years,

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Mr. Reese: Clinkers in fireboxes are due to failure to shake the grate. If the Road Foreman of Engines checked up the engines as they came in and reproved the fireman for not shaking the grates, the clinker trouble would not occur. After we did this we were able to maintain the box grate without a dump grate.

Mr. Wandberg: Thank the Lord we are getting away from the dump grate on our road. We are striving to get away from it altogether. It is responsible for more failures on locomotives than any other one cause. We are putting in the table grates and we use all kinds of coal. If our present type of grates does not serve its purpose, let us try to get one that will, but don't argue in favor of the dump grate. My experience has been that if there is not sufficient opening in the ash pan, grates will clinker.

Mr. Laughridge: As the committee had no complete report, they appreciate the information brought out in the discussion. I move we close the subject and carry it over for the next convention, a committee to be appointed to bring in definite data. Whoever is on that committee should consider the power shaker, as I understand a bill before Congress now will, if passed, compel the equipment of all engines with power shakers. We use the power shaker grate, and think they can be improved.

Mr. Strinsky: Please have that committee take up atmospheric conditions at sea level and in mountain country.

The motion was carried and the meeting adjourned.

AFTERNOON SESSION.

The convention was called to order at 2 P. M.

The President: The first topic to come before the convention is, "What is the best method of scaling super-heater flues in the boiler?" etc.

REPORT OF COMMITTEE ON

"Best Method of Scaling Superheater Flues," Etc.

Mr. Harry D. Vought, Secretary, Master Boiler Makers Association,
New York City.

Dear Sir: Replying to your letter dated April 2nd, 1919, in connection with report on Topic No. 4, for our convention next month, with the information that after receiving your first letter dated March 17th, 1919, I sent out a large number of letters to members asking for information on these various subjects covered in Topic No. 4, and to date have received no answers to my letters, due no doubt to the fact that they did not have the time to give this subject which it really requires. It is true I could make up a report giving my own opinion and views, together with the two committeemen who wrote me, but I do not think this sufficient on so important a subject, especially at this time, as I have second hand information that there are a number of new tools on the market for cleaning flues as well as welding superheater flues. In view of the above facts, I do not feel that I have had sufficient time since receiving your letter to collect the proper information and data required to make whatI would consider any kind of an intelligent report suitable to bring before the convention.

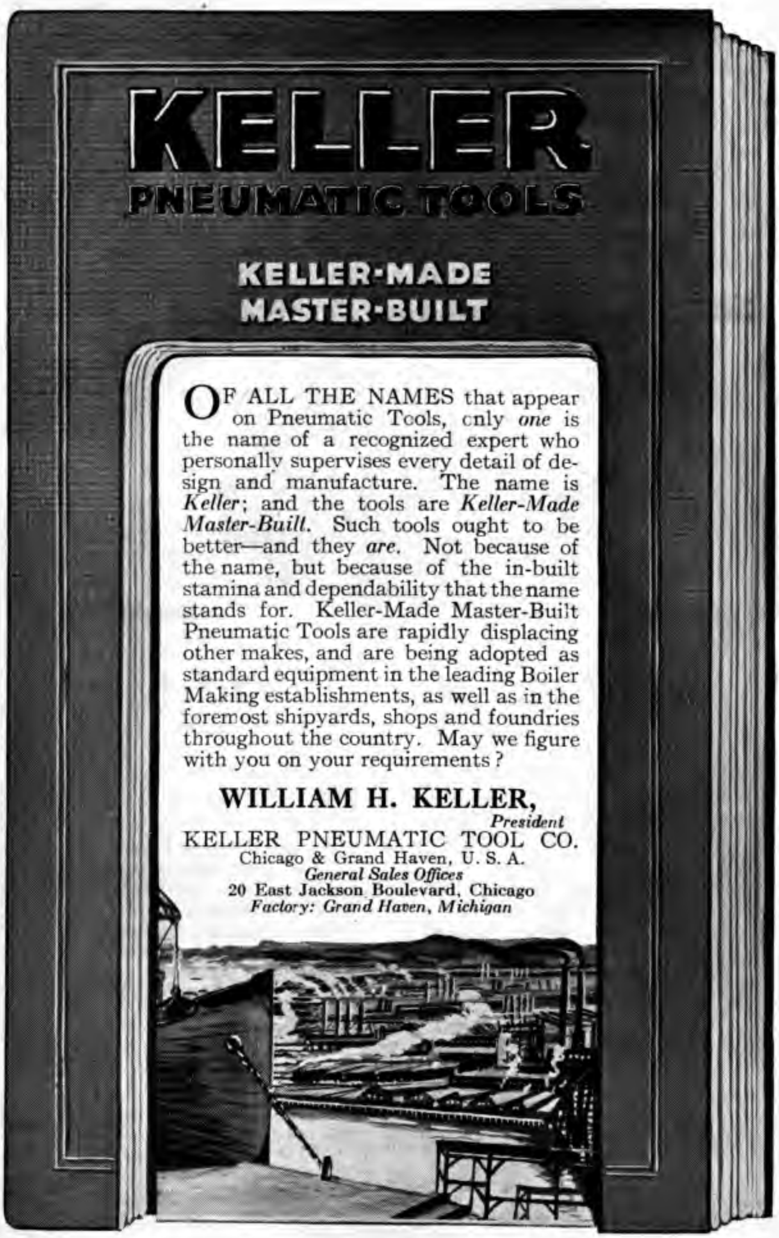
I would therefore, recommend that this subject, as well as the committee be continued to our 1920 convention.

W. J. Murphy, Chairman.

The President: Will some one open the discussion on superheater flues?

DISCUSSION.

Mr. A. N. Lucas: When engines come into the shop and the units are taken out, we use a Lagonda Cleaner, with which all the carbon is rattled from the inside of the flue, at the same time trying to hit it hard enough to knock some of the scale loose on the outside.



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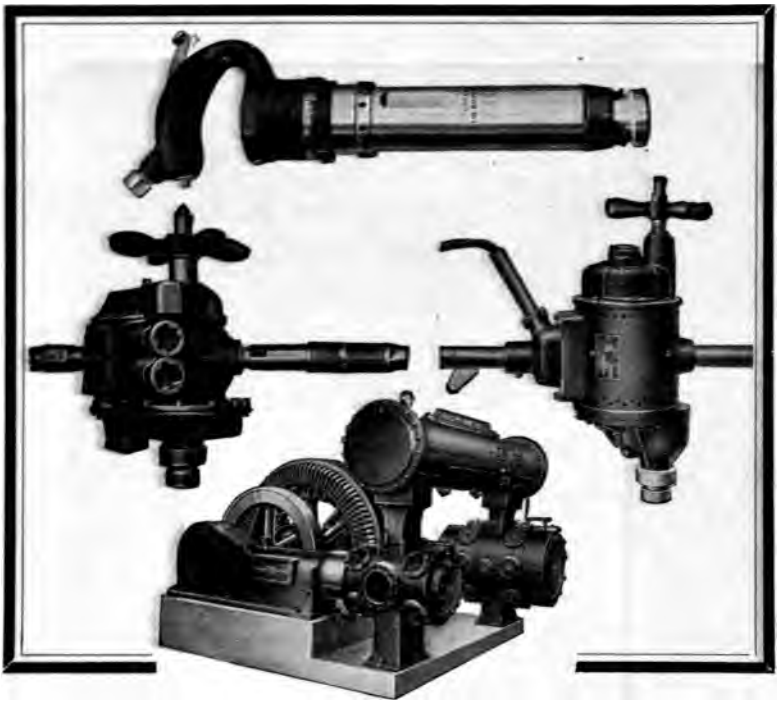

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Mr. Whalen: Our road bought 39 engines three years ago, and we have not removed any of the super-heater flues. Whenever the engines go through the back shop, we remove all the two-inch flues; we remove the zig-zag flues up among the super-heaters. We use a four-inch Lagonda Flue Cleaner. We are in a hard water district. The water contains about 29 per cent. foreign matter. Turbining super-heater flues gives good results. If the firebox has any bad scales on the flues we chip them off and re-electric-weld them. We do not electric-weld the two-inch flue. The super-heaters we electric-weld all the time.

The President: We would like to hear from Mr. Andrew S. Greene.

Mr. Andrew S. Greene: As a member of the committee on cleaning flues in and out of the boiler, I did not make a report as I had been hunting for some better method than we employ at our shop. We use the old fashioned rattler. We have a hopper over the rattler that drops a set of flues into the rattler with a single movement. We unload the rattler the same way; that is, roll them out into a pit using a rope sling to lift them out with cranes on to a truck on which they are taken into the shop. We use water in the rattler and do not clean flues dry. If we crowd the rattler we can get 700 flues in it at a time.

Mr. A. N. Lucas: How do you take care of flues in the boiler?

Mr. Greene: We never clean super-heater flues in the boiler; take out all of them when dirty.

The President: That is when the engine comes in for general repairs?

Mr. Greene: General repairs and the removal of tubes. In welding our flues we use a Furgeson forge and a roller welding machine.

A Member: How large is your flue rattler?

Mr. Greene: Sixty inches in diameter. It is driven with a 60 horse-power motor.

The President: The rattler or the welder?

Mr. Greene: The rattler.

Mr. A. N. Lucas: Do you find that the inside of the super-heater flue becomes heavily coated, and have hard work removing the units? If they were not cleaned by the turbine, would you not have a hard job getting the units in again?

Mr. Greene: We have not had trouble of that kind as we remove the flues from the boiler and clean them in the rattler.

Mr. Lucas: How long do they last before removal?

Mr. Greene: Eighteen months to three years.

Mr. Lucas: Do you take them out every time they receive general repairs? You cannot let them run three years. Do your engines come into the shop every 18 months for general repairs?

Mr. Greene: Sometimes we get from [illegible] to 150,000 miles out of an engine and sometimes only [illegible]. We generally take out the whole set of flues unless an engine comes in for slight repairs, when we remove only the small flues and save the super-heater flues.

Mr. Lucas: Do nothing with the big ones?

Mr. Greene: We have done much electric welding of flues but have decided to run engines [illegible] to [illegible] days and then send them to the round-house for welding. Mr. Sarver made a trip through different shops three or four weeks ago and could give you more information about cleaning flues than I can. I would like to hear from Mr. Sarver.

Mr. Sarver: I was investigating the proposition of flue rattlers at that time and not the cleaning of super-heater flues of the boiler. At our plant we run a set of super-heating flues twice as long as the small flues. We do not have much to do in the way of removing the scale from the interior of the flues. If Mr. Lucas has, he is not taking very good care of his super-heaters and, therefore, is losing a great deal of efficiency on his engines.

Mr. A. N. Lucas: Don't you have a flue plugged around the units?

Mr. Sarver: Yes, that is the reason you clean them.

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Mr. A. N. Lucas: How do you clean them?

Mr. Sarver: We have an apparatus for blowing out flues and another on the end of a long rod with which we loosen sediment and scale around the flue, when it cannot be taken out any other way. We have gone so far as to remove the super-heater. Probably that is one of the great reasons we have much trouble with our superheaters. One of our members who is on a road running into Canada claims that a superheating engine should have the flues cleaned every trip and I heartily concur in his opinion.

Mr. A. N. Lucas: We have never had a collapsed super-heater unit. Have you?

Mr. Sarver: No, sir, not to my knowledge; we have had them leak on the end.

Mr. Lucas: Have you had them pit through at the front flue sheet and fill up the flue entirely from a slow leak?

Mr. Sarver: No, sir.

Mr. Lucas: Have you had any large super-heater flues collapse owing to light weight?

Mr. Sarver: Not to my knowledge.

Mr. C. R. Bennett: I have had them collapse on account of mud.

Mr. A. N. Lucas: Why don't you wash your boiler.

Mr. Greene: I have had several super-heater flues collapse under hydrostatic test, on account of their light weight.

Mr. C. R. Bennett: A large super-heater flue in one of our large super-heater locomotives used in freight service, collapsed while under hydrostatic test pressure. After examining the boiler and the flue, we decided it was due to failure to properly wash the boiler, the boiler washer not having followed instructions. We are instructed to cool down the boiler, wash out its water legs and barrel in order to get rid of the excessive accumulation of mud, then use a long crown sheet nozzle, inserting it full length in over the crown sheet, turn on the water and move the nozzle outward. In this way, we prevent the washing of scale and mud on to the flues washed sideways of the sheet into the water space; the foreign matter falls down in the water leg and passes out of the boiler. In the case mentioned we found that the men used a short nozzle. By inserting it in the washout holes in the back head, they were getting the crown sheet clean, but piling up mud between the flues the full length of the boiler. The flues became solid with mud, which caused the body of the flue to become hot. It began to draw, and of course each time the boiler was washed, more mud found its way between the flues. As a result the flue lost its efficiency and collapsed when hydrostatic pressure was applied.

Mr. Lucas said he was not able to get the units out of the flues. This is because the units in super-heater flues are not maintained as they should be. His troubles are due to allowing super-heater engines in service with clogged flues, continuing them in service with blind gaskets in super-heater unit head, applying super-heater units in a bent or twisted condition, and failure to have the super-heater units rest the proper distance with the corners filed round. If these defects are remedied, I will guarantee he will have no more trouble in removing super-heater units. We have more than 100 locomotives with super-heater units and we do not experience the trouble Mr. Lucas described.

Mr. Berry: How do you remove dirt between the flues? Only a long nozzle will do it.

Mr. A. N. Lucas: Take the flues out.

Mr. Austin: Scale is the result of precipitation of solids in the water during evaporation. It accumulates chiefly where there is the most evaporation. Like any other cement or concrete, it will form regardless of the temperature, provided it has sufficient binder to hold the mixture together. Once formed, boiler washing will not remove it. It is a lot of bunk to criticise boiler washing. Scale has to be knocked off or removed with chemicals or a water supply provided that does not form scale.

Yesterday corrugated crown sheets, etc., and leaking radials were spoken of. Many times we found our radial stays leaky; apparently the boiler is clean. We cannot say it is the scale and we cannot say it is poor boiler washing, but those conditions are usually found in bad water districts. Usually there is not much incrustation but the feed water is heavily charged with salts, which were precipitated and accumulate on the surface, eventually causing overheating. There is no such thing as a film of steam formed between the water and the sheet; nor can the water be driven off a fire box sheet; it never did and could not happen. It is true tests have been made in which a small pipe has been placed through the outside close up to the firebox sheet. Steam showed when the valve was opened while the engine was working and it was concluded that the cause was a film formed next to the firebox sheet. I believe the water next to the firebox sheet is heated to a very high temperature; so much so that when it is tapped, as was done in these experiments, it flashes into

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steam and pretty hot steam at that, because it has no chance to cool. In bad water districts when the firebox is cooling, streaks of alkali salts exude from very small leaks. If the water could be concentrated to the extent that these formations from these leaks would indicate it would be impossible to use the water in the boiler for making steam. The film of slime or salts is formed on the plate, overheating occurs, and staybolts, flues and other joints are loosened sufficiently for these salts to leak through and form stalactites or alkali streaks. These salts are soluble so that when the boiler is being emptied they can be dissolved with the water and be carried out, the boiler looking very clean inside. Sometimes the film becomes too heavy or thick on the vertical plate and sloughs off; mixes with the water and causes foaming.

Mr. T. F. Powers: We have recently limited the weight of superheated flues because when applied to locomotives and perfectly clean, they collapsed. Their standard weight is seven pounds to the foot for a 5⅜ flue. Collapsing of superheating flues is not always due to their not being clean. Probably some will be found badly deteriorated and light, the same as a two-inch flue. Remember, they are of greater diameter and will not stand what a two-inch flue will.

Mr. Mitchell: We have a rattler 21 feet long. We have engines with flues 22 feet 8 inches long. For these we have a machine operated with a staybolt motor. It gives very good success for outside scale, but the inside of a flue is not struck hard enough to clean it. This machine is used only on 5¼ or 5½ flues.

Mr. Tate: Mr. Powers said the limit for superheated flues on his road is seven pounds to the foot. How is a defective flue detected?

Mr. Powers: We weigh the flues. Our blue print says that a flue for a certain engine must have a specified weight.

Mr. Tate: My experience in handling superheated tubes is that they wear out at various places. In that case how are we to decide a flue is defective by its weight as the sediment in it will weigh more than the wasted material.

Mr. A. N. Lucas: If it ought to weigh 90 pounds when new and weighs only 70 second-handed, whether it ought to go in the boiler again or not can be quickly decided.

Mr. Tate: That is good, with the exception of two, four, six or eight inches at the end, where, by piecing, we have just as good a flue as when we started.

Mr. A. N. Lucas: I doubt it. Several flues I inspected collapsed at the center and not at the end.

Mr. Tate: The proper way to detect a defective superheater tube is by the hammer test. An experienced boiler maker can find it when not in the boiler.

Mr. A. N. Lucas: Is that the way you detect a two-inch flue when it is light? Don't you weigh it?

Mr. Tate: Yes.

The Secretary: Mr. Patrick moves that "When a superheated flue becomes scaled to the extent that it needs cleaning, the best method is to remove the flue and clean it in a rattler." Carried.

Mr. Austin: The use of a knocker or rattler on the inside of the large superheated flues to remove the carbon is favored by some of our people. It requires an expensive machine to start with as well as expensive labor to operate it. It also takes much time. The chances are nine out of 10, that when a locomotive goes to the shop, it is steaming all right which is the main thing. What little carbon may be in that flue would not amount to much and it would be practically a waste of labor to go to this expense and trouble to remove it. I am speaking of this as much for the benefit of some of the men of our road who are here, and have that bug in their heads. As for others, it is only a bug. The action of the cinders and the action of the sand and the oil burning through it, to my mind comes close to taking care of any particular accumulation of carbon.

Mr. C. R. Bennett: The question is a local affair. As Mr. Lucas has said, if an engine comes in for repairs and there is a disposition to run it another year and wear out the firebox, or if the foreman thinks the flues ought to come out, he is responsible and can order them out without interference.

Mr. Reddy: Our practice is to carefully inspect every superheater flue after it has been cleaned and made ready for the boiler. If we find any kinks or flat places, we straighten them with a mandrial, using an acetylene torch and a small wooden mallet. We never have a flue collapse.

Mr. Patrick: Mr. Reddy's remarks are entirely out of order, though it is true the preparation of the flue before it goes into the boiler is a matter to be determined by the shops, and is a point well taken. We ought to keep our flues perfectly round. I move the subject be closed.

The motion was carried.

(Vice-President Tate in the Chair.)

MISCELLANEOUS BUSINESS

The report of the committee on President's Address was next presented and indorsed the lofty sentiments as well as the views so clearly expressed by President Lucas at the opening session.

On motion of Mr. Laughridge the report was adopted.

THE SECRETARY: The secretary has been repeatedly asked as to the registration at this convention. It is possible now to tell you that it is 735, exclusive of the supply men. (Applause.)

Although we did not have a convention for two years and passed through a period that tried the hearts and minds of men and women of this and foreign lands, members have come forward and shown genuine interest in this Association by paying back dues. Even those who were behind for a considerable period, notably one for 14 years. That shows the spirit which animates the boiler makers. (Prolonged appause.) Now, my friends, I am simply the clerk and slave of this Association. I have not been outside this hotel since I came into it last Saturday. Having served you 13 years, may I not be permitted to say to every boilermaker, continue the example you have furnished at this convention; don't stay away from the next convention; don't fail to send in your dues when you get your bill, and you will not have to stand in line at the registration, as some have on this occasion, until their ankles were nearly broken; you will have all the spare time you want, and this Association, and with a growth of close to 200, double the record ever made for 13 years, I guarantee to you the greatest strength you have ever had. This association will be known throughout the United States and Mexico and Canada as one of the strongest, best and most practicable organizations of mechanical men in this country. You represent the foundation of power, without which no railroad can operate, nor any establishment dependent upon steam. Therefore, the opportunity is given to furnish the example to every organization of mechanical men of remaining on the job as you have done here at this convention, and of going home filled with new practical ideas which you can apply in your chosen craft. Thank you. (Applause.)

MR. PATRICK: Look at this hall as evidence enough that we are sticking on the job. I appreciate the Secretary's efforts in every manner but I do not approve of the method of registration. It is too slow. If our secretary is re-elected, which I believe and hope he will be, I hope he will map out some course that will not keep 15 or 20 men in line.

THE SECRETARY: Don't blame your secretary, gentlemen, blame yourselves.

MR. PATRICK: What?

The Secretary: Don't blame the secretary, but blame yourselves. There is no man in this association for whom I have more profound respect than my good little friend on my left (referring to Mr. Patrick), who was one of the first at Cleveland, 13 years ago, to take me by the hand and made me known to the boilermakers; but he overlooks conditions. Our method of registration was not responsible for so many being in line. When a bill for dues is sent, March 31st, members have nearly two months in which to forward a postal or express order or a check for the small amount of two dollars. Membership cards are ready for distribution and promptly mailed. All that remains to be done at the convention is to register soon after your arrival and receive a convention badge.

Mr. Patrick: Right!

The Secretary: That is the simple way. This was stated in a postal card mailed to every member in advance of this convention and repeated in the official program. Send dues in advance and it will relieve you of embarrassment and confusion at the convention. Is that not correct?

Mr. C. R. Bennett: Yes, you did everything but take $2.00 away from us.

The Secretary: I will take two dollars away from you every time I can for this Association. Allowance must be made for conditions attending this convention. No one had greater sympathy for you than I did when you stood in line, but I could not help it; it was your fault, and you know it. If you had sent your dues, you would not have been obliged to await your turn. Now, boys, that is the practical way of doing it, and make it much sight easier for the Secretary and his staff. Then I will be able to go out and get a little fresh air, which I have not done since last Saturday.

Mr. Patrick: I simply made my remark to facilitate the checking in of the men.

The Secretary: At Cleveland we did not have a particle of trouble; we started in 24 hours ahead. I came here Saturday for the same purpose. At Cleveland we started the registration on Monday, and Tuesday and Wednesday the situation was so simple that we were able to loaf on the job; we were able to get out of doors between sessions for I had two automobile rides myself and released an extra clerk who was no longer needed. This year we had two extra clerks and you know they were constantly busy. Please, please do what I ask you; I will make it so easy for you, if my life is spared one year hence and it is your pleasure to have me serve you, that you won't be bothered at all.

Mr. Laughridge: Mr. President, a resolution has been presented to your Executive Board that has been considered by various organizations in the last two months, and, as I understand, adopted by all. The Board unanimously recommend its adoption by this Association.

(The resolution, after discussion, was laid on the table.)

Mr. Goodwin: In 1901-2, as I recall it, about 11 boilermakers met in St. Louis, Mo., and organized what was known as the International Boiler Makers' Association. At that time we had a Master Boiler Makers' Association in Chicago. The speaker was fortunate enough to be a member of both. Their history up to the time they consolidated in Cleveland is pretty well known. Two years ago we organized what is known as a Past Presidents' Association and of which I have the honor of being President. We contemplate having a meeting in the Secretary's room after the adjournment of this session. You may wish to know why we have such an Association. We can accept only one member at a time. He passes through the chairs, and our object is to discuss what a healthy baby we have on hand from year to year. We feel proud of the opportunity to congratulate you on developing from a small number up to such a sturdy organization as we have today. The only ones interested are those who have passed through the chairs. We would like to have them attend this meeting for a few minutes.

Mr. G. W. Bennett: Mr. Goodwin, while our present president is not yet a past president, I believe he is entitled to attend that meeting, is he not?

Mr. Goodwin: I think so. He will be one of our members after the close of his term; we will initiate him.

The session then adjourned until Thursday, May 29, 1919.

FOURTH DAY

THE PRESIDENT: All past presidents are requested to occupy seats on the platform. We have no addresses this morning. The first item on the program is the report of the Auditing Committee.

REPORT OF THE AUDITING COMMITTEE

Your Auditing Committee has examined the accounts and books of the Secretary and the Treasurer and find that the Secretary has forwarded to the Treasury $11.00 more than his accounts require and would recommend that this amount be refunded to him.

We wish to express our high appreciation of the efficient service rendered your association by the Secretary and the Treasurer as revealed by our examination of their accounts.

G. W. BENNETT, Chairman.
T. F. POWERS.
FRANK GRIFFIN.

The report was accepted and ordered spread on the minutes, the committee being discharged with the thanks of the organization.

REPORT OF COMMITTEE ON MEMORIALS

The report of the Committee on Memorials was next presented as follows:

Your committee submits the following:

It having pleased our Heavenly Father in His infinite wisdom to remove from our midst C. C. McCandless, by his passing from this life, this association has lost a true and loyal member, a man of sterling worth, and his wife a devoted husband. Be it

Resolved by the Master Boiler Makers' Association in convention assembled, at the Sherman Hotel, in the City of Chicago, that we express our heartfelt sympathy to his widow and loved ones in their bereavement; that a copy of this resolution be sent to Mrs. McCandless and that it be printed in our Official Proceedings.

P. J. CONRATH,
J. A. DOARNBERGER,
J. B. TATE,
Committee.

On motion of Mr. Hodges, the report was adopted and the committee discharged with the thanks of the association.

The Chair: We will now have the report of the Committee on resolutions.

The report, which was presented by Mr. Laughridge, was as follows:

REPORT OF THE COMMITTEE ON RESOLUTIONS

To the Officers and Members of the Master Boilers Makers Association:

Your Committee on Resolutions respectfully submits the following for your consideration and recommends its adoption.

It is with great pleasure that the Master Boiler Makers' Association in the final session of its Eleventh Annual Convention is again afforded an opportunity to acknowledge its obligations to the City of Chicago, its Chief Magistrate, its people and its business men for the happy and perfect manner in which they have once more welcomed us to the great metropolis of the West, promoted our comfort and recreative pleasure and accorded us a fresh insight into the underlying conditions which have advanced Chicago to its proud position in the forerank of popularity, industrial and commercial supremacy, and one of the greatest and most attractive convention cities of the United States.

We appreciate the opportunity to know and specially commend the systematic ,highly intelligent and energetic work of the Chicago Chamber of Commerce, which in no small measure is responsible for the attainment of results of such great practical benefit. In this we recognize how effectively the advantages of the city are daily brought to the knowledge of both local and transient interests.

The broad hospitality, uniform courtesy and thoughtful kindness so lavishly displayed has impressed our hearts and minds, compelling our admiration and sense of gratification. It serves as an inspiration as well as an incentive for still more earnest endeavor on our part to prove our worthiness of such consideration. It also stimulates our earnest wish for still greater achievement for the advancement of our fellow men; to never lose sight of the unmeasureable responsibility devolving upon us and our calling, in striving for still higher achievement for the protection of life and property as a guarantee to humanity in the practice of our art, and that we be always mindful of the importance of making our best interests mutual.

These thoughts and sentiments have in part been prompted by the fervent invocation of Rev. Dr. Rufus A. White, of Chicago, the memorable and eloquent addresses of Harry D. Miller, Prosecuting Attorney, representing His Honor, William Hale Thompson, Mr. Frank McManamy, Assistant Director, Division of Operation of Federal Controlled Railroads, Mr. A. G. Pack, Chief of Locomotive Boiler Inspection, R. H. Aishton, Regional Director of Federal Controlled Railroads and H. T. Bently, Superintendent Motive Power, Chicago & Northwestern Railway.

We have further occasion to refer with pleasure to the Hotel Sherman and its management for having insured our comfort and corresponding contentment during our brief sojourn here.

To the Boiler Makers' Supply Mens' Association we are particularly indebted for making us their special guests at the social festivities and other pleasurable events connected with their meeting, especially the very enjoyable entertainment directed by Mr. J. L. Ponic, and which have been so conducive to relief from the cares and absorption of the more serious business engaging our close attention.

In the liberal space given our proceedings in the daily newspapers of Chicago, and in the technical journals, eespecially the *Boiler Maker, Railway Age, Engineering News, Railway Journal, Railway Review, Master Mechanic, Railway Mechanical Engineer* and many others, further recognition is given to the importance of the position our Association occupies and the value of its work is substantially attested. We are most appreciative of this genergus kindness and desire to express our hearty thanks for this attention.

The social side of our conventions would be akin to a barren waste were it not for the brightness, good cheer and delight that comes from the attendance of the members of the SWomen's Auxiliary and their solicitude for our continued success and prosperity.

Appropriate recognition is due and is herewith given to the men in official station who have carried on the business of the Association, so conscientiously, intelligently and successfully during the past two years. Their administration in all things testifies to their tact and wisdom and signifies that their conduct of its affairs has been prompted by the highest consideration for its uninterrupted progress. The splendid results of this convention demonstrate that they are the crowning feature of their labors, the proof of duty well performed. In meriting our unqualified approval they receive the reward prompted by the confidence and good will of their fellow members.

Finally and by no means least, a meed of praise is due the Local Committee of Arrangements for the faithful performance of their responsible duties and which placed special features upon our Official Program that will be long remembered and greatly valued.

W. H. LAUGHRIDGE, *Chairman*
M. O'CONNOR
CHARLES. P. PATRICK

MR. JOHN F. POWERS: I move that the report be accepted and the committee discharged with the thanks of the association. Carried by a rising vote.

LAW COMMITTEE'S REPORT RECONSIDERED

On motion of A. N. Lucas the convention reconsidered its action on the recommendation of the Committee on Law to abolish the offices of Fourth and Fifth Vice-Presidents.

After again discussing the question pro and con, Mr. Patrick moved to make the change effective one year hence but the motion was not seconded.

Mr. Hodges moved to not concur in the proposed amendment and it was so ordered.

ELECTION OF OFFICERS.

The President announced that the election of officers for the ensuing year was next in order and appointed as tellers, Mr. Hempel, Mr. Elkins and Mr. Laughridge, the latter being displaced by E. W. Young when the ballot for treasurer was taken, as he was named for treasurer with an opposing candidate.

The election of the president and vice-presidents and the secretary was without opposition, a consolidated ballot being cast for each in order to conform to the requirements of the Constitution and By-laws, and the result being as follows:

President—John B. Tate, of Altoona.

First Vice-President—Charles P. Patrick, Cleveland.

Second Vice-President—Thomas Lewis, Sayre, Pa.

Third Vice-President—Thomas P. Madden, St. Louis.

Fourth Vice-President—E. W. Young, Dubuque, Ia.

Fifth Vice-President—Frank Gray.

Secretary—Harry D. Vought, New York.

Treasurer—W. H. Laughridge.

When nominations for First Vice-President were in order, Mr. Patrick magnanimously sought to decline the compliment in favor of Mr. Frank Gray, but being unable to persuade Mr. Gray to consent to this, he reluctantly allowed his nomination to stand. Mr. Gray's later election as Fifth Vice-President was the occasion of an unusual demonstration, all the members rising and cheering and applauding the announcement of the ballot. It was an ovation which Mr. Gray received with characteristic modesty as he voiced a brief acknowledgment of the honor accorded.

In nominating Mr. Gray, Harry F. Weldin expressed the sentiments of others as well as himself when he said: "Ever since this organization has been in existence, I believe, we have had with us a man who has been faithful in every way. The whole interest of his heart and mind has been with this association. He has worked with us; he has attended conventions even when he was not physically able, and has done everything for this organization that he possibly could."

Mr. Weldin and Mr. Laughridge were nominated for Treasurer, the vote being 93 to 86 in favor of Mr. Laughridge.

Mr. Weldin had asked without success that his nomination by Mr. A. N. Lucas be withdrawn, saying: "Without regard to whether I have been an officer in this association or not, I have always found it a pleasure to work for this association for its best interests and always will, and thank my nominator for his courtesy, but hope he will withdraw my name." After the result was announced, Mr. Weldin said: "I thank the members for voting the way they did. I did not want the position; it is a responsible one, and I do not think you could have a better man for it than the one selected. I therefore move that the election of Mr. Laughridge be made unanimous."

The motion was carried.

Nominees receiving the largest number of ballots for member of the Executive Board for three years were Thomas F. Powers, Edward J. Reardon of Chicago, and Harry F. Weldin of Philadelphia, Henry J. Wandberg of Milwaukee, being also elected a member to fill the unexpired term of one year of Mr. Laughridge.

Acknowledgments were made by the officers and members of the board, as follows:

Mr. Tate: It is impossible to adequately express my gratitude for your action. No one can realize the feeling a man has when he receives such an expression of confidence and regard as you have accorded me. The office of President of this Association is no sinecure. Responsibilities very hard to grasp are before me and I bespeak your forbearance. If I err in anything, frankly and manfully tell me of it. My desire is to be able to do my duty as far as within me lies, but I must have the loyal support of each individual member of the association. While we may be separated and a great distance lie between us, if there is anything I can do to help or assist you in any way, do not hesitate to correspond with me, not only as to association affairs, but anything relating to our line of business. I will willingly and gladly give you any information or help I can. Beyond that I feel that we have done the right thing by continuing the fourth and fifth vice-presidencies. I have worked five years for this position, and the nearer I got to the top, the more responsibility I felt. I thank you beyond expression for your favorable opinion of me.

Mr. Patrick: I appreciate the honor you have conferred on me. I expected it, naturally; we are all coming up the line, and I will serve you in the future just as I have in the past. I will attend strictly to business and hope my good friends in the Association will all be with me.

Mr. Madden: I certainly appreciate the honor you have conferred on me. I know of no interest in which I will take greater interest in performing my duty than as Third Vice-President of this organization. I am certainly glad that we still continue to have a Fourth and Fifth Vice President. I know that it will be educational for them, as we are always studying, aways watching the man ahead of us.

Mr. Young: To say that I am grateful is putting it mildly. You men are always near and dear to me. Why shouldn't you be? I am one of you; your interests are my interests. It has been the general custom for years for the outside world to look on a boiler maker as nothing but a roughneck, and when they do that, I am ready to fight. (Laughter and applause.) We are going to be respected just the same as everybody else in this world. I intend to repeat what I said here four years ago when I told you who you are and what you are, as I think you are, because I believe it and because it is true. Chicago has had a convention of the world's greatest men. Why? Because we are living in the age of steam. It is steam that runs our mills, our factories, our electric plants, our ships and our railroads. Steam could not be used without boilers, and boilers could not be made without us. Therefore we are the people. (Laughter and applause.) We are the ones upon whom everything depends. (Applause.) We make the wheels go around in this wonderful old world of ours. Without us, all would be stagnation. (Laughter and applause.) I hope that I will live to meet with you next year and a good many years after, but remember, that the man who builds the boiler is the man who moves this world. (Laughter and applause.)

Mr. Vought: Having originally been chosen, when a complete stranger to nearly all of you, to serve you as Secretary, it is indeed a great honor to have been annually retained in that capacity. Also, to have made so many strong and sincere friends in the association intensifies the spirit of pride and gratitude felt in this latest expression of your confidence and esteem. My only regret is that I am only half a boilermaker, being glad to personally so record myself, as I have hearing on only one side of my head. Thank you, gentlemen. (Applause and laughter.)

Mr. Laughridge: Gentlemen, you have demonstrated by your vote the truth of the old adage: "Always ready to ride a willing horse." I have been on the executive board for nine or 10 years; in fact I have been an officer of the association ever since it was organized, and always willing to do anything to promote its best interests. The position in which you have now placed me will call for a greater sacrifice than ever, as I am busier than many of you, but I shall endeavor to serve you to the best of my ability.

A Member: We are going to have you bonded any way. (Laughter.)

Mr. Reardon: I am very thankful for the honor conferred upon me and will serve you to the best of my ability.

Mr. Powers: I thank you from the bottom of my heart and will continue to do as well as I can.

Mr. Weldin: My actions in the past have shown what it was my wish to do and it should be an assurance of my best efforts in the future.

Mr. Wandberg: Accept my assurances of appreciation. My election was a surprise as I did not know my nomination was contemplated. Just here permit me to say in this connection that I have been much impressed by the harmony prevailing during the convention and the absence of unseemly strife. As a member of many associations for a number of years the kindly feeling prevailing has been most gratifying. I thank you most cordially for my election and will try to render the service expected of me.

The President: We would like to hear something now "for the good of the order.

"GOOD OF THE ORDER."

Mr. Whalen: I wanted to say a few words before the Eleventh Annual Convention of the Master Boilermakers' Association adjourns. Whether it be for the good of the organization or not, is for you to decide, but I know it will do me good to comment upon what I have seen this week in this convention. Before a child can walk it must learn to creep, and it must be able to walk before it can run. I have just joined the association, therefore, I am just creeping. I spent last week in the Fuel Conservation Convention in this same hotel. Much stress was placed upon team work and co-operation. The same can be applied to this organization. I am gratified to say that there is a much larger percentage practiced in this association than there is in the Fuel Conservation movement.

There is a parable in scripture where one man was given five talents, another three, and another one. The one receiving only one talent went off and buried it. I have tried to stay away from that class of people. If I only know a little and an opportunity presents itself, I am ever ready to avail myself of an opportunity to get more knowledge, and I believe that by coming to this association I have benefited wonderfully. I have found out how other roads in this country do their work. Although I do it in a like manner, it is gratifying to know that I am doing the work like the other fellow, or trying to do it. It may be that he has a little better way. I get that kink straightened out, go home and try to overcome the shortcomings I have and apply the shorter and quicker method. It is team work, fellow members, that enabled the railroads in the United States to put every Liberty Loan over; that after five Liberty Loans had been disposed of, we could all rightfully quote this little poem:

The first loan put our boys over there,
  The second helped them to fight,
The third kept the home-fires burning,
  While the fourth put the Huns to flight.

Our boys are homesick,
  My boy and your Jack.
We put the fifth loan over,
  To bring them safely back.

(Applause.) As my boy expressed it, it was through co-operation and team work, he having pulled the trigger on a six-inch shell gun in every important battle in which our boys took part in France, he returned home with only a slight cut on his little finger—the only injury he received. He said it was through team work they were able to go over the top in the Argonne Forest, at Champaigne, at Chateau Thierry, at St. Michl and Sedan. It was the grandest piece of co-operation that the world has ever known and it is through such co-operation that we can put our shoulder to the wheel as the Master Boiler Makers' Association, and each man do his part. We are all in this world to fill a certain place, to solve a certain problem in life. Let it be said of each one of us as we go home, maybe never to attend another convention, that we left work for the next generation to take up that will not only be an inspiration to the government as a whole, our country as a whole, but will be a benefit and an inspiration to all who read and follow us. (Applause.)

Mr. Powers: One man attending this convention, has probably been more instrumental in making it a success than any other one man in the United States. Before we adjourn a hearty vote of thanks should be accorded first to Mr. Frank McManamy and then to Mr. Pack, for their co-operation and assistance. The attendance at this convention and at each session speaks for itself. Every chair in the house has been filled, and if any member has asked another what he was talking about, it was due to the misfortune of not being able to hear. (Applause.)

Mr. Powers' suggestion was put as a motion and carried

Mr. Weldin: One of the difficulties of the Executive Board at the present time is to select an acceptable place for the meetings of our conventions. Our association has gained in membership and has grown to such a size that few places even the larger cities can provide necessary hotel accommodations. We had to go to a theatre across the street to hold our opening exercises. We came back to this room with its limited seating capacity. As one of the members of the board, I would like an expression of opinion from members as to whether we should have a permanent meeting place, that it be large enough, or should go to the different cities of the country for our conventions. It is the prerogative of the board to select the place but they want to be guided by your wishes. We are not to select a place where the members can have a good time or go sight-seeing, but one that will be for the best interests of the organization.

Mr. Young: The question of having a permanent meeting place has come up often and been voted down. I was in favor of it but it seems to be the opinion of the majority that we ought to go East and West. As long as they feel that way it is what we ought to do. We have held a convention in the West, let us go East next year.

Mr. Conrath: I have discussed this matter with many master boiler makers throughout the country. It seems to be their wish that our conventions be held in different cities. Some of them perhaps get away from home only for this convention and would not like to be compelled to go to one place all the time. At some future time we ought to go still further west and further south and then back east again.

Mr. Whalen: Why not go to the city on the banks of the White river—Indianapolis—the largest inland city in the United States. We have had some of the largest conventions there held in the United States. They were accommodated satisfactorily. Indianapolis is one of the best railroad centers in the United States. There is only one depot and that is within five minutes' walk of five or six as good hotels as there are in the United States. Indianapolis has the best interurban terminal station right in the heart of the city. All the electric roads run into it. It is the same way with the steam roads. The United Mine Workers have held their convention there several times and they have thousands of members. Tomlinson Hall will seat thousands. The Severn, a new hotel, is about as fine as any in the middle west and will accommodate the Association if our convention is held there. When the Democrats held their convention in Denver, in 1908, "Abe" Martin said they made a mistake by holding it so far west; that W. J. Bryan would be nominated before the Indiana delegates got as far as Terre Haute. That is the way "Abe" put it. Of course we know that if we start for the Boiler Makers' Convention we are going to get there, no matter where it is held, but Indianapolis would be an ideal place for next year.

Mr. Hempel: We can leave the matter of a place of meeting with the Executive Board, which will receive propositions from various cities.

Mr. Young: Here we are right in the center of the west; Indianapolis is in the center. We have been at Louisville, Detroit, Cleveland, and Omaha, but we have never been to the capital of this country; why not go to Washington next year?

A Member: Or California. (Laughter and applause.)

The Secretary: San Francisco is one of 14 cities that has through its convention bureau and chamber of commerce, asked for the convention. One city has not done so, I suppose, because they are tired of inviting you without an acceptance. I refer to St. Louis. Two or three years ago it was suggested that the city wanting the convention should say what it will do to make it interesting, pleasant and profitable for the members. It does not seem fair (and I am saying this without the slightest consultation with the supply men or knowledge of their opinion in the matter) that the burden of providing entertainment should be placed entirely upon the shoulders of the Supply Men's Association. The city which gets the benefit of the convention should do something. What was the result of the suggestion I mention? Two years ago you were to have met in Richmond, Va. That city was made to show what it would do and if you had gone there excelling anything in your history. The governor of the state and men of equal prominence and influence were to be the speakers. The dignity and character and reputation of the Boilermakers' Association should demand that the city wanting the convention, should go on record with an agreement with the Executive Board as to what it will do if given the convention. The association will be correspondingly benefited. (Applause.)

MR. GOODWIN: Why would it not be advisable for the Secretary or Executive Board to state what cities have asked for the convention.

THE SECRETARY: I gave Mr. Laughridge the invitations this morning. The cities as I remember them are Chicago, New York City, Columbus, O., San Francisco, Buffalo, St. Joseph, Mo., Detroit, Mich., Worcester, Mass., Kansas City, Toledo, Asbury Park, New Jersey, Atlantic City, and others.

MR. WELDIN: The Executive Board has been given something to work on. We want not only to do the best we can for the organization, but we want to please our members in every way, and when suggestions are given us for consideration we will do the best we can.

MR. STRINSKY: I believe these conventions should be held further west. If you hold the meeting on the Atlantic coast, look at the distance I have to travel. I might as well go to China. If the middle west is given the preference everybody can attend. If the convention is held too far east, what are we fellows in the west to do? We have to travel about 10 days to get there.

A MEMBER: Well, you will enjoy it.

THE SECRETARY: When it was decided to go to Omaha, the declaration was made: "That settles it; we will have only a corporal's guard." Men from the east exclaimed: "Why, we can't go that far!" One of the best conventions you ever had, and one of the best attended for the size of the association at that time, was held in Omaha. The supply of badges was exhausted and more had to be provided. (Applause.)

A MEMBER: It seems to me that the next convention ought to be held at Washington, D. C.

Mr. Madden: I reside in St. Louis, the metropolis of the West. We have as fine hotel accommodations as any city, with beautiful boulevards, residences, parks, etc. I am confident that if the next convention were held in St. Louis no cause for regret would be experienced.

Mr. Whalen: Enough has been said on this subject and it ought to be left to the Executive Board to decide.

The President: The Constitution and By-laws so provide.

Mr. Young: I move that we adjourn.

The President: Before the motion to adjourn is put, permit me to say that I did everything I could to make this convention a success. I had the hearty support of all the members, officers and different committees and wish to thank them as well as every individual member for attention and good work at this meeting.

To have been president of this organization is one of the greatest honors ever given me. I am glad that the organization decided to nominate a fifth vice-president. I considered it an honor when I was elected to that office and this feeling has been intensified a little ever since, though it took me eight years to reach the presidency.

A Member: Think of how long you were president!

The President: Well, we had no convention from 1916-1919, on account of the war. Otherwise some one else would have had the office.

The motion for adjournment was put and carried.

PAST PRESIDENT'S ASSOCIATION.

The Past Presidents held their Second Annual Meeting in Parlor "B" of the Hotel Sherman with the following members present.:

President, J. T. Goodwin; Secretary, W. H. Laughridge; M. O'Connor, J. A. Doarnberger, Charles Hempel, George Wagstaff, Arthur E. Brown, A. N. Lucas, Andrew Green, P. J. Conrath, J. T. Johnston, Daniel A. Lucas, G. W. Bennett.

After pleasant greetings and a few remarks from several who were in a reminiscent frame of mind, the President announced that the election of officers was in order, the result being the re-election of Mr. Goodwin as President and W. H. Laughridge as Secretary for the ensuing year.

New Members Enrolled Since 1916.

ACTIVE

Albrecht, F. H., B. M. F., Mobile & Ohio R. R., 407 S. 16th St., Murphysboro, Ill.
Anderson, J. A., G. F. B. M., Industrial Wks., 216 N. Madison Ave., Bay City, Mich.
Andrich, Fred, Boiler Foreman, Santa Fe Ry., General Delivery, Amarillo, Tex.
Badger, R. L., F. B. M., Erie R. R., Galion, O.
Bailey, G. G., B. M. F., N. Y. C. R. R. Co., 120 Lake Shore Ave., Toledo, O.
Barnes, W. R., Chief Boiler Insp., 563 Oak St., Macon, Ga.
Becker, J. B., G. B. M. F., S. P. Co., 1435 Hopkins St., Berkeley, Cal.
Bell, W. D., B. M. F., Southern Ry., 4325 Ave. B. South, Birmingham, Ala.
Best, J. B., Boiler Foreman, Northern Pacific, Box 92, Staples, Minn.
Bleick, W., Gen. Foreman, G. H. & S. A. R. R., El Paso, Tex.
Bliss, Geo., F. B. M., N. Y. C. R. R. Co., New Durham Engine House, N. J.
Blount, Frank C., F. B. M., Southern Ry., 1101 N. 23rd St., Richmond, Va.
Boersig, H. F., B. M. F., S. P. & S. R. R., 1206 W. 15th St., Vancouver, Wash.
Brennan, John, F. B. M., Grt. Northern R. R., Everett, Wash.
Brooks, W. A., F. B. M., Penn. Lines West, Wellsville, O.
Burdett, Thomas E., B. M. F., C. & N. W. R. R., 509 Elmore St., Green Bay, Wis.
Burno, L. J., B. M. F., N. P. R. R., 1067 Como Pl., St. Paul, Minn.
Burnside, R., Dist. Insp., N. Y. C. R. R., 105 E. 3rd St., Oswego, N. Y.
Butler, Chas. C., Asst. Gen. Boiler Insp., C. R. I. & P. R. R., Box 804, Horton, Kans.
Cahill, Jeremiah, Dist. Boiler Insp., G. N. R. R., Glasgow, Mont.
Calmback, G. M., Boiler Maker & Welding Supv., Kans. City So. Ry., 435 W. 6th St., Pittsburg, Kans.
Chellis, J. F., Asst. B. F. & Insp., L. A. & S. L. Ry., 2688 Merced St., Los Angeles, Cal.
Churchill, J. W., B. M. F., M. P. R. R., Osawatomie, Kan.
Clare, James E., Insp., Bureau Loco. Inspection, I. C. C., 1301 Kimball Bldg., Chicago, Ill.
Collins, Jas. P., Insp. of Locomotives, I. C. C., 402 P. O. Bldg., Omaha, Neb.
Collins, William J., Boiler Insp., Spokane, Portland & Seattle Ry., 1125 Missouri Ave., Portland, Ore.

Conley, P., Foreman, Galveston Term., 2120 Ave. "P," Galveston, Tex.
Connor, Roy, F. B. M., Kansas City, Mexico & Orient R. R., 333 N. Market St., Wichita, Kans.
Conroy, R. L., Asst. B. Foreman, I. H. B. R. R., Hammond, Ind.
Coon, Walter C., Div. Boiler Insp., N. Y. Central R. R., 33 Butler Ave., Buffalo, N. Y.
Cooper, H. M., Boiler Foreman, B. & O. R. R., 423 E. McKibben St., Lima, O.
Corns, Chas. C., Boiler Foreman, C. & N. W. Ry., Belle Plaine, Iowa.
Craddock, Robert B., Chief Boiler Insp., W. S. R. R., Braddock Heights, Virginia
Crowley, John, F. B. M., Burlington R. R., 1320 Penn. St., St. Joseph, Mo.
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Dougherty, T. C., Boiler Foreman, H. & T. C. R. R., 308 N. Dallas St., Ennis, Tex.
Douglass, Charles H., F. B. M., Central Vermont, 36 Main St., Albans, Vt.
Doylem, Daniel, B. M. F., C. & N. W. Ry., Fond du Lac, Wis.
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Forbell, Willard, Asst. B. M. F., L. I. R. R., 94 Main St., Astoria, L. I.
Gibler, Peter J., Gen. B. F., G.,C. & S. F. Ry., 720 N. Angline St., Cleburne, Tex.
Gill, K. K., B. M. F., Atlanta & W. P. R. R., 215 N. McDonough St. Montgomery, Ala.
Gjertsen, Gus. H., M. B. M., N. P. R. R., General Delivery, St. Paul, Minn.
Glenn, Wm., Boiler Foreman, S. A. & A. P. R. R., Yoakum, Tex.
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ASSOCIATE

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Constitution and By-Laws

As Amended 1908-1909-1911-1913-1915-1919

ARTICLE I.

NAME.

"Master Boiler Makers' Association."

ARTICLE II.

The object of this Association shall be the mutual improvement of its members by an exchange of ideas in meetings, the reading and discussion of papers, and a general interchange of views, so that all may profit by the experience of others more proficient in our craft.

ARTICLE III.

Section 1.—The officers of this Association shall consist of a President, First, Second, Third, Fourth and Fifth Vice-Presidents, who shall be active Master Boiler Makers, Assistant Foremen or General Boiler Inspectors and engaged as such at the time of election; a Secretary and a Treasurer.

Sec. 2.—The office of President, First, Second, Third, Fourth and Fifth Vice-Presidents, Secretary and Treasurer shall be elective at the annual convention.

Sec. 3.—The election of officers of the Association shall be by ballot. They shall be elected separately, and a majority of all votes cast shall be necessary for choice.

Sec. 4.—Only active members in good standing shall be allowed to ballot for officers.

ARTICLE IV.

EXECUTIVE BOARD.

Section 1.—There shall be an Executive Board, to consist of nine (9) members.

Sec. 2.—The Executive Board shall be elected by ballot, said Board to elect their chairman to serve during the time of his incumbency, each elected member to serve three years.

ARTICLE V.

DUTIES OF PRESIDENT.

It shall be the duty of the President to preside at all meetings of the Association; to appoint all committees; decide all points of arder; receive and submit all motions duly made by the members; put to vote all motions regularly made, announcing the results, and voting only in case of a tie; and he shall exercise general supervision over the affairs of the Association.

ARTICLE VI.

DUTIES OF VICE-PRESIDENT.

The Vice-President shall assist the President in such duties as he may require; and in the absence of the President shall preside at the meetings of the Association and perform all the duties of the office in their order.

ARTICLE VII.

DUTIES OF THE SECRETARY.

It shall be the duty of the Secretary to keep a correct record of all meetings of the Association, attend to correspondence, keep a record of the membership, receive all moneys and remit the same at stated intervals to the Treasurer, take charge of all books, papers and other property, and perform such other duties pertaining to his office as may be required of him by the Association.

ARTICLE VIII.

DUTIES OF THE TREASURER.

It shall be the duty of the Treasurer to receive and receipt for and safely deposit in a bank all moneys belonging to the Association; he shall keep a correct record of all moneys received, and submit to the President, Secretary and Chairman of the Executive Board, a quarterly statement of the condition of the treasury, showing the balance on hand at the previous report, the amount received and disbursed since the last report, together with the balance on hand; and shall pay out no moneys except on a voucher drawn by the Secretary and approved by the Chairman of the Executive Board.

ARTICLE IX.

BOND OF OFFICERS.

The Secretary of this Association shall be bonded by a Security Company for the sum of $1,000. The Treasurer shall be bonded for the sum of $2,000. The expense thereof shall be borne by this Association· The Executive Board shall be the custodian of the bonds.

ARTICLE X.

DUTIES OF THE EXECUTIVE BOARD.

SECTION 1.—The Executive Board shall exercise a general supervision over the interests of the Association ; to call, to prepare for and to conduct annual conventions ; to make all necessary purchases, expenditures and contracts required; to conduct the current business of the Association.

They shall have no power to make the Association liable for any debts to an amount beyond that which at the time of contracting the same shall be in the Treasurer's hands in cash and not subject to prior liabilities ; all expenditures shall only be made by appropriations acted upon by the Executive Board.

SEC. 2.—The Executive Board shall make a report of the proceedings of each of its meetings, such report to be made accessible to all members of the Association. It shall have the proceedings of the regular meetings of the Association published, subject to the instructions from the latter. It shall have the power to withhold from the published proceedings, papers and reports containing old matter readily found elsewhere, those especially meant to advocate personal interests, those carelessly prepared or controverting well-established facts, and those purely speculative or foreign to the purpose of the Association, or any which in the opinion of the Board are unworthy of publication.

SEC. 3.—Two-thirds of the members of the Executive Board may call special meetings of the Association, to be held not less than thirty days after notice thereof has been mailed to each member of the Association.

SEC. 4.—The Executive Board shall have power to change the place of meetings if deemed necessary for the best interests of the Association.

ARTCLE XI.

MEMBERSHIP.

SECTION 1.—*Active Members* shall consist of Master Boiler Makers, Assistant Foremen and General Boiler Inspectors who are practical boiler makers, and filling such position at time of application.

Any subsequent change in their occupation or position, unless entirely foreign to the trade of boiler making, shall not affect their status in the Association, and they shall remain active members thereof during the time that they retain their membership and conform to all the rules and regulations of the organization.

Applicants for active membership shall submit their request in writing, give name in full and name and address of the road or company by which they are employed.

Applications for active membership must bear the signatures of at least two members of the Association in good standing.

Sec. 2.—*Associate Members* shall consist of men who have served as Master Boiler Makers, or others whose experience will be valuable to the Association. Such members shall not have the privilege of voting.

Sec. 3.—*Honorary Members.* shall consist of those who have served as active members and on account of old age or ill health have been obliged to retire from active service, or others who will be valuable to the Association

Sec. 4.—Applications for membership may be approved by the Chairman of the Executive Board during "recess" periods of the Association but must be finally ratified at the next annual convention by the Association; such member shall not be required to pay dues.

ARTICLE XII.

FEES AND DUES.

Section 1.—The initiation fee in this Association shall be Three Dollars ($3).

Sec. 2.—The Annual dues shall be Two Dollars ($2) per year, payable in advance on April 1st of each year.

Sec. 3.—The initiation fee of $3 shall accompany each application for membership. Dues payable as per Section 2 of this Article.

ARTICLE XIII.

MEMBERS IN ARREARS.

Members in arrears for dues may occupy seats in the convention, but they shall not be entitled to vote or take part in any discussion, nor in the transaction of any business brought before the convention, until such arrears are paid ; and after the expiration of one (1) year the Secretary shall notify such members that they will be suspended for non-payment of dues unless their arrearage is paid within thirty (30) days after such notice has been given. Members shall not be entitled to receive a copy of the published proceedings of conventions unless their dues have been paid as required by the Constitution and By-Laws.

ARTICLE XIV.

Any member of this Association may at any time withdraw from this Association by making application for a withdrawal card which will be granted provided his dues are paid for the year in which application is made and which can be deposited at any time thereafter he desires by paying one ($1.00) dollar, the application being subject to Section 4 of Article XI. of this Constitution.

ARTICLE XV.

MEETINGS.

SECTION 1.—The place for each annual meeting shall be fixed at least six months before the annual meeting by the Executive Board, to which all invitations therefor shall be sent by the Secretary to the Chairman of the Board. The Board shall also at the same time decide upon the days and hour of assembly, and when determined shall at once notify the Secretary of the same and the Secretary shall mail to each member not later than 60 days in advance of such annual meeting, notice of the place, date and hotel rates, with such other information concerning the arrangements as may be in his possession. Immediately after the place and time have been fixed the President shall appoint a local committee to make all necessary arrangements for the convention, and they shall have charge of the same. The convention shall continue four (4) days, with daily session from 9 A. M. to 1 P. M., these hours, however, to be subject to change as circumstances may make necessary, and the convention may determine by a majority vote of the members present.

ARTICLE XVI.

COMMITTEE REPORTS FOR ANNUAL CONVENTIONS.

SECTION 1.—The President shall within 30 days following his election appoint a committee of three for each topic to report at the next annual convention on such topics as are adopted for that occasion, and also a committee of three to report a list of subjects in advance for the next succeeding annual convention.

SEC. 2.—The reports of all standing and special committees must be in the office of the Secretary not later than March 1st in order that the same can be printed and advance copies issued by April 1.

Such reports shall be prepared for printing and presentation to the convention by the Chairman of each Standing or Special Committee to whom each member of a Committee shall send, not later than January 1st, his individual report, such individual report to be read before the convention if desired or called for, but only the report printed shall be included in the published Proceedings of the convention, unless such individual report, or a minority report of the Committee, shall be adopted by a majority of the convention in place of the majority of the Committee.

Each Chairman of a Committee shall promptly submit the report prepared by him to his associates on his Committee and obtain their concurrence, amendment or rejection, a majority of the members concurring to govern in the final adoption of the report for presentation to the Convention.

Committee reports which do not reach the Secretary in time for printing and issuing by April 1st, will be referred to the Executive Board to decide whether the report shall be submitted to the Convention.

The Chairman of Standing and Special Committees will read an abstract of the report of the Committee before the Convention, together with whatever additional data may have been accumulated after April 1st, to the date of the Convention.

The members of Standing or Special Committees, who may individually or collectively submit a minority report, must prepare the same so that it can be issued with the report of the majority of the Committee, to substitute for the majority report in the event the Convention should so decide.

Each member of a Standing or Special Committee shall sign either the majority or a minority report.

SEC. 3.—***Quorum.*** Nine members at any meeting shall constitute a quorum for the transaction of business, but any less number shall have power to adjourn to any time and place they may deem proper.

ARTICLE XVII.

SECTION 1.—There shall be a standing committee on law to consist of three members to be appointed by the President after assuming the duties of his office and said appointments shall include at least one member of such committee who served in such capacity during the year preceding an annual convention of the Association.

SECTION 2.—At the first session of each annual convention the President is authorized to appoint for the period of such convention the following committees, and additional committees which circumstances may make necessary for the time the Association is in session:

Auditing by an expert accountant,
President's address,
Memorials,
Resolutions.

SECTION 3.—The president is further authorized to appoint annually a special committee of three, after the selection of the place of meeting for the annual convention, whose duty it shall be to arrange for special speakers, and make such other arrangements for the convention as may be found necessary.

ARTICLE XVIII.

AMENDMENTS.

No article or clause to the foregoing Constitution shall be altered, amended or repealed except at an annual meeting and then only by a two-third (2-3) vote of the members present.

ARTICLE XIX.

ORDER OF BUSINESS.

1. Roll-call.
2. Report of Officers.
3. Report of Committees.
4. Unfinished Business.
5. New Business.
6. Election of Officers.
7. Appointment of Committees
8. Adjournment.

Membership List

IMPORTANT NOTICE TO MEMBERS.

Those whose names do not appear in this list will understand that they are in arrears for dues to and including 1919, and are suspended from membership until the amount due is paid as provided by the penalty clause of the Constitution and By-Laws, official notice having been mailed to their last known address.

If your name is wrongly spelled or the address given is not correct, please notify the Secretary at once that errors may be corrected in Index Card system which has been installed in place of a book record. Also kindly give immediate notice of any future change in your title, business connection or post office address.

HONORARY MEMBERS

Duntley, J. W., Union League Club, Federal St. and Jackson Blvd., Chicago, Ill.

Duntley, W. O., Pres., Duntley-Dayton Co., 1416 Michigan Ave., Chicago, Ill.

Krum, William, 1315 Tenth St., Manitowoc, Wis.

McManamy, Frank, Asst. Director, U. S. R. R. Administration.

Pack, A. G., Chief Insp. Loco. Boilers, I. C. C., Washington, D. C.

Pratt, E. W., S. M. P., C. & N. W. R. R., 215 N. Oak Park Ave., Oak Park, Ill.

ACTIVE MEMBERS

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Andrich, Fred, B. F., A. T. & S. F. Ry., General Delivery, Amarillo, Tex.

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Bader, Cornelius, F. B. M., M. C. R. R., 737 Military Ave., Detroit, Mich.
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